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~ edward abbey

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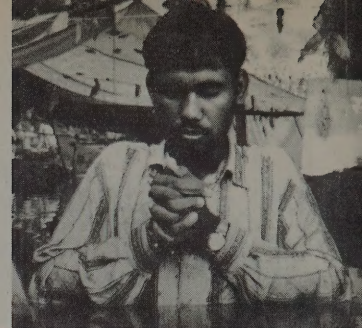
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Winter 2001

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THE Electric Dragon

A transformation of the Energy Web is under way. Local power has become less costly, more reliable, and more secure. As the mainframe devolved to laptop, the Renewables Era could turn your home or car into a power generator as well as consumer. "Micropowers" like fuel cells, solar, wind, geothermal, tidal, wave, and biomass will replace aging central power plants and electric power will distribute itself closer to home.

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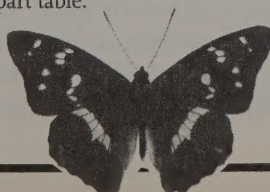
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COMPARISON IS KEY

New learning is a victory for the human spirit.
So is empathy.

Mary Catherine Bateson

The moments when individuals experience a change in perception are moments of opportunity, most especially if we can remember the thoughts and feelings that preceded the shift, and understand the nature of their continuing validity. Comparison is key. When Kennedy was assassinated, most people remembered thinking of him living as a great president, even if only days before they had been ambivalent. Couples that divorce sometimes describe their marriages as having been uniformly unhappy, but usually there was a time in the past that was happy, a time that might be worth remembering. It is useful to have the experience of seeing the same person, situation, or idea in more than one way, since both may be true, or neither. Sometimes yet a third vision may be more useful.

Suddenly we have a sense of vulnerability, but surely the attack on the World Trade Center was theoretically possible a decade ago; we have never really been invulnerable. Suddenly red, white, and blue appears everywhere; does this indicate a changed quality of citizenship or patriotism? At one level yes, as something taken for granted is suddenly highlighted. What can be learned by comparing two points of view?

Since World War II, the world has seen radical shifts of opinion and perception, and many of them seem to have been positive. Fifty years ago, friendship between France and Germany was unthinkable, alliance between the US and Japan impossible. Within a few short years the Soviet Union was the Evil Empire, but now we cooperate with the FSU on space flights. Fifty years ago, legal segregation was taken for granted through the entire American South; women were widely seen as incapable of advanced work in science; homosexuality was perverse disobedience to God's laws. As for the environment, it was a trivial issue left to "little old ladies in tennis shoes."

If our perceptions can shift so radically and so rapidly, are so clearly relative to circumstance, can we imagine how other circumstances would forge other perceptions? Can we use our imaginations to understand why terrorists act as they do? Americans expect to be loved

and admired, and resent it when they are not. But both love and hate have a context and a history. We could decide to be more widely loved and respected.

Here are some comparisons we could make that might lead to policy changes that would be supported by changes in public opinion if they were presented with conviction and imagination: We could think deeply about the damage done to the US economy by the attacks, and understand that economic warfare is not bloodless. In affluent countries it leads to unemployment and lost savings, while in Third World countries it can lead to famine and epidemic. We could therefore lay aside the weapon of economic sanctions, which affects ordinary people rather than the governments we seek to punish.

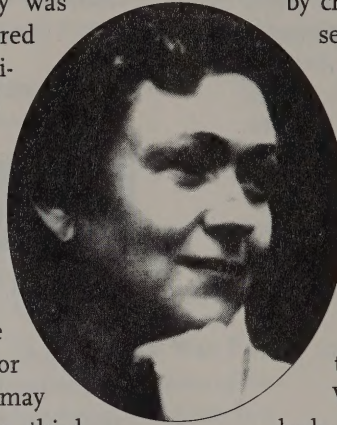
We could take notice of how much we suddenly care about the support of our allies and give our support to the various treaties and international efforts the Bush administration has rejected, from Kyoto to land mines. We need our friends too much to bully them into supporting us on distasteful policies, including economic sanctions, while rejecting their concerns.

We could learn from historical comparisons that certain policies result in hate. The Treaty of Versailles sowed dragon's teeth, generations of enmity. The Marshall Plan made the friendships of contemporary Europe possible. Again and again, the search for political advantage has led the United States to arm regimes we cannot respect and has prolonged conflicts so that whole generations grow up knowing only war.

We can compare our reactions to the terrorist attacks to our milder reactions to natural disasters and consider our special sensitivity to missiles in Cuba in order to understand sensitivities to incursions and occupations.

We can consider how much the symbolism of the WTC and the Pentagon add to our distress and understand why many Muslims are especially sensitive to foreign troops near to the Holy Cities.

It is important not to allow the terrorist attacks to defeat us or to leave us cowed. But we cannot allow them to shift us into a purely reactive mode. We must let them stimulate our imagination; a narrowed and limited imagination is a product of trauma. New learning is a victory for the human spirit. So is empathy. **we**



Mary Catherine Bateson is hugely heartfelt and multicultural—with interests in the Middle East, linguistics, and anthro; and books on AIDS, her parents (Gregory Bateson and Margaret Mead), learning and thinking about life change (*Composing A Life*). She's lived in Iran and married a great guy from Turkey.

OUR CITY OF FRIENDS

“I dream’d in a dream I saw a city
invincible to the attacks of the
whole of the rest of the earth,
I dream’d that was the new
City of Friends.”
—Walt Whitman

We asked friends what they loved (a book, a tool), something so good that they would give as a gift to a friend. We asked what organization has heart and mindfulness and felt right (and, at times, fun) for those who prefer making donations to giving things. Here’s their mini-*Whole Earth*. —PW



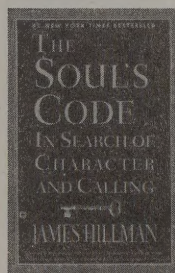
Alan AtKisson is director of arts and culture for the Sustainability Institute (www.sustainabilityinstitute.org) and author of *Believing Cassandra*.

The Soul’s Code, by James Hillman, is a very useful book indeed, for it helps you make peace with the fact that you are you. In our hyper-therapy-ized, over-ritalined, Oprahed-out popular culture around psychology, we tend to blame everything on our parents or credit everything to our genes. Hillman, one of the most distinguished Jungians of our day, a scholar and an intellectual original with a gift for exceptionally clear and engaging writing, sets the record straight. We are inherently mysterious. We come into this world unique, with a unique calling. We follow that inner voice, that angel-like soul (that daimon, as Plato called it)—or, stifled, we can become demonic.

The Songbird Foundation gets major artists (Bonnie Raitt, Jackson Browne) involved, and helps wake people up to the major threat to our fantastically beautiful migratory songbirds (morning color, morning music) caused by drinking nonorganic, unfairly traded coffee (morning jolt). The good news: If you switch to “green” coffee—the good stuff, it tastes better—you can drink as much as you

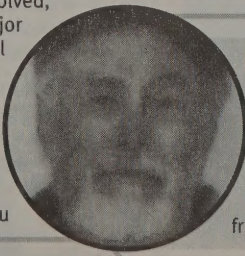
want. This is one time when more is better: Birds can live in places where coffee is literally “made in the shade,” where coffee plants share space with trees. Often, now, that’s the only place they can overwinter in Latin America. Market demand for such coffee actually increases bird habitat.

So: Join Songbird, switch coffees, save birds. Win, win, win.

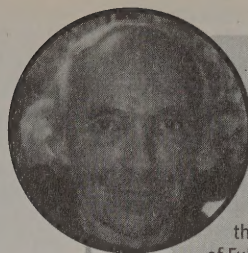


THE SOUL’S CODE
In Search of Character
and Calling
James Hillman
1997; 352 pp.
\$12.99
Warner Books

THE SONGBIRD
FOUNDATION
2367 Eastlake Avenue E.,
Seattle, WA 98102.
206/374-3674,
www.songbird.org

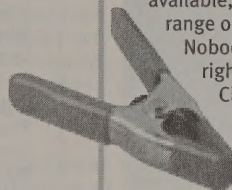


Will Baker was *Whole Earth’s* first reporter at large (in Nicaragua) and then all over the planet, talking to teenagers about their desires and visions of the future. He’s an avid dad, scribbler, and farmer of 125 acres of fruit orchards and decorative flowers.

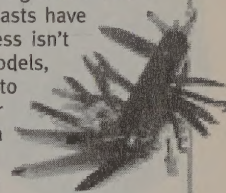


J. Baldwin’s pungent, perceptive articles and reviews on tools, ecological design, and a myriad of other topics have graced our pages for a quarter-century. His *Bucky Works: Buckminster Fuller’s Ideas for Today* remains the lucid introduction to making use of Fuller’s thought.

Wottle I ever give Uncle Olaf for his birthday? He already has everything. The answer is easy if the obligatory gift is for someone who makes things: **clamps**. Young or old, male or female, send ’em clamps at every opportunity for the rest of their lives. There are a zillion models available, and each type comes in a wide range of sizes. Nobody has enough clamps. Nobody has exactly the one they need right this minute. They all need clamps! Clamps! Clamps! Nyahahaha. Let ’em eat clamps! (They’ll love you for it).



And **Swiss Army Knives**. Tired of Swiss Army Knife jokes, I kept track of how frequently I deployed my “Champ” model. Turned out to be about 2,000 times in one typical year. I bought it in 1985. That’s about 32,000 times I’ve taken care of some minor problem right then and there. The versatile little beasts have their flaws, but being useless isn’t among ’em. For the fatter models, you’ll need a belt holster to avoid wearing through your pocket bottoms. Not just a yuppie male gift, either; females and old-enough kids will welcome an appropriate model.



I use my Swiss Army Knife’s magnifier lens and the tweezers more than any other “blades” (splinters are an inevitable part of country living). Unfortunately, the Champ’s lens and tweezers are not perfectly adapted for that ticklish task. Worse, you need three hands and a prehensile belly button to keep the image in view and manipulate the tweezers at the same time. The best extraction device I’ve seen is the **Magni-Grip**, a super-sharp tweezer hinged to a powerful magnifier. Lots of stores carry them, but they’re hard to see on the shelf. Ask.

SWISS ARMY
CHAMP KNIFE
About \$60 at, for instance,
www.rei.com

MAGNI-GRIP
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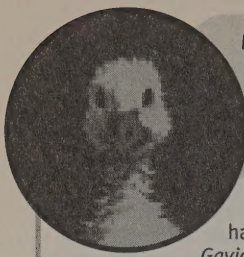


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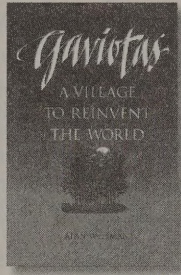
A flat-tipped **calligrapher’s pen** and a standard text for that art, like *Writing and Illuminating and Lettering*. It encourages creativity and style (and care). Unlike email!!

WRITING & ILLUMINATING & LETTERING
Edward Johnston
1995; 434 pp. \$14.95
Dover Publication

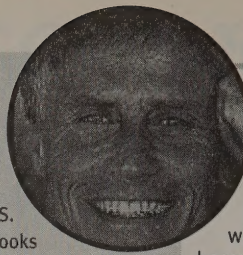


Molly Bang is an award-winning children's book author and illustrator. She has written reviews for *Whole Earth* for years.

Two years ago I must have sent fifteen copies of *Gaviotas* to friends. It remains a remarkable story of hope. (I'm writing you on September 11 from a friend's house in Texas as her TV repeats the World Trade Center destruction and now some missile attack on an oil depot in Kabul.) All I like to give to friends these days are foot massages, especially after supper. Neither tool, book, nor organization, but they are a joy for me.



GAVIOTAS
A Village to Reinvent the World
Alan Weisman
1999; 240 pp.
\$14.95
Chelsea Green

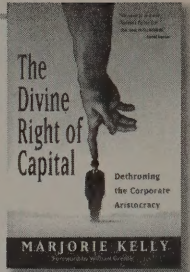


Paul Hawken has written for *Whole Earth* and served as a friend and advisor to Point Foundation for decades. He helped found The Natural Step in the US. His *Whole Earth*-flavored books include *The Ecology of Commerce*:

A Declaration of Sustainability and, with Amory and Hunter Lovins, *Natural Capitalism: Creating the Next Industrial Revolution*.

I would give anything that reminds the recipient of where we live, whether it be food, a species identifier, a course in bird-watching, or native plants. Goods that reknit the fabric of local artisans and small landholders. I would cultivate locality and avoid the exotic, the far away, the store-bought. A book I would give is *Power Politics*, by Arundhati Roy (see page 81). The other book is equally powerful, *The Divine Right of Capital* by Marjorie Kelly, a book utterly revealing of the rank idiocy of modern corporate economics. Neither book will depress you. The first is a

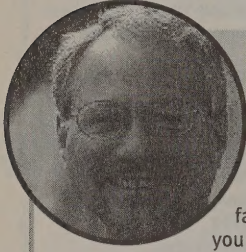
call to all writers and artists to participate in the critical issues of our age. Marjorie's book will exhilarate you, because it is such a thorough de-masking of the indefensible.



For a donation, I would give to **Food First**, an organization that links food, water, democracy, and justice together in ways which are impossible to gainsay, but possible to do.

THE DIVINE RIGHT OF CAPITAL
Dethroning the Corporate Aristocracy
Marjorie Kelly
2001; \$24.95
Berrett-Koehler

FOOD FIRST/INSTITUTE FOR FOOD AND DEVELOPMENT POLICY
398 60th Street, Oakland, CA 94608.
510/654-4400, www.foodfirst.org



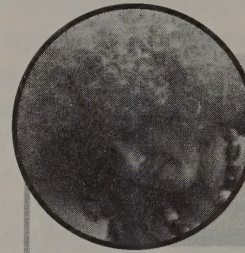
Richard Conlin is a member of the Seattle City Council.

I'm a voracious reader, so I am going to give you five books that I think are fascinating reading, and tell you why:

Development as Freedom, by Amartya Sen: an award-winning economist presents an intriguing new paradigm that challenges both right and left concepts of "development." *Rationality and Power*, by Bent Flyvbjerg: intriguing account of how politics, administration, and planning mix. Wonderfully original and practical exploration of how to run a democratic society. *The Lexus and the Olive Tree*, by Thomas Friedman: A challeng-

ing and thoughtful exposition of the workings of the new international system; dogmatic leftists beware.... *A Suitable Boy*, by Vikram Seth: the longest novel ever written in the English language is a dazzling panorama of India by one of the best novelists in the world; you'll laugh, you'll cry, you won't be able to put it down for 1,400 pages. *The Ground Beneath Her Feet*, by Salman Rushdie: music, mythology, and the incredible writing of Salman Rushdie at his best.

And the organization to give to: why, of course, **Positive Futures Network**, lighting the way to a sustainable future.



Linda Connor, a *Whole Earth* contributing editor, is a world traveler and photographer who teaches at the San Francisco Art Institute.

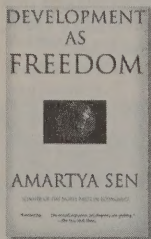
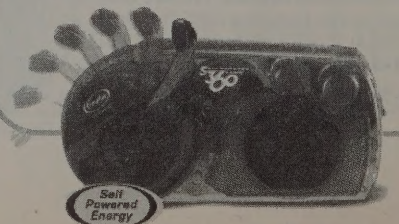
I received a **Freeplay AM/FM radio** as a gift, and it's nifty. No batteries; you power it either by an easy-to-wind crank or by its built-in solar panel (they automatically work in tandem). In these tense times, I'd also give **Tibetan prayer flags**, available from Tibetan shops. My favorite new gift book is *Remains of a Rainbow: Rare Plants and Animals of Hawai'i*, by David Liittschwager and Susan Middleton [see page 88]. Groups to donate to? **Any arts organization** (they're all struggling), the **American Friends Service Committee**, **Ploughshares**, **Planned Parenthood**.

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888/588-2372, 215/241-7000, www.afsc.org

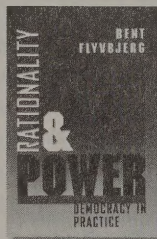
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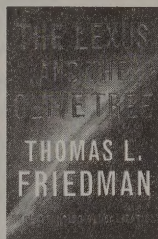
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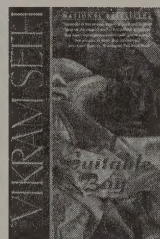
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Amartya Sen
2000; 366 pp. \$15
Anchor Books



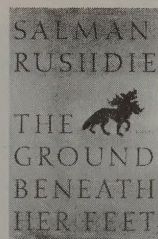
RATIONALITY AND POWER
Democracy in Practice
Bent Flyvbjerg
2000; 296 pp. \$17
University of Chicago Press



THE LEXUS AND THE OLIVE TREE
Understanding Globalization
Thomas L. Friedman
2000; 490 pp. \$15
Anchor Books

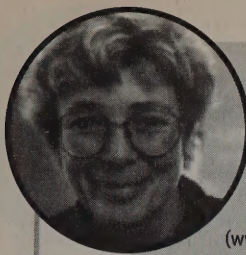


A SUITABLE BOY
A Novel
Vikram Seth
1994; 1,500 pp. \$21
HarperPerennial



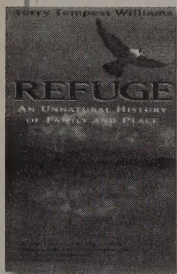
THE GROUND BENEATH HER FEET
Salman Rushdie
2000; 575 pp. \$16
Picador USA

POSITIVE FUTURES NETWORK
PO Box 10818,
Bainbridge Island, WA 98110-0818.
800/937-4451, 206/842-0216,
www.futurenet.org/aboutPFN.html

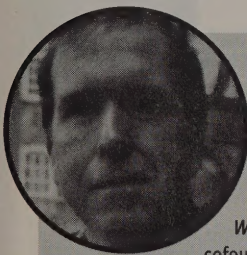


Patricia Holt, former book editor for the *San Francisco Chronicle*, writes the email column and website "Holt Uncensored" (www.holtuncensored.com).

Each year I try to give a copy of *Refuge*, by Terry Tempest Williams to any woman on my list whose mother is ill or has just died. *Refuge* is the story of the author's mother, who is dying, the nearby bird sanctuaries that Williams (a naturalist) describes to us, and an environmental crisis. Society's aggressive response to kill or stop "the enemy" (cancer, flooding) is contrasted with the lessons of nature and the human heart. The story reads like a novel and ends with an unexpected twist that makes this book a refuge for life.



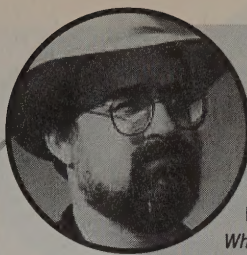
REFUGE
An Unnatural History of Family and Place
Terry Tempest Williams
1992; 304 pp. \$13
Vintage



Kevin Kelly edited *Whole Earth Review* from 1984 to 1990, before becoming *Wired's* first editor. He graciously returned to guest-edit our Winter 2000 issue, in the style of early *Whole Earth Catalogs*. He cofounded the WELL and the Hackers Conference, and lit the spark for the All Species inventory project (*Whole Earth*, Fall 2000).

One of my family's favorite places to give is the **Heifer Project**, which for fifty years has been providing families in developing countries (and parts of the US) with breeding pairs of animals. They started out donating a breeding pair of cows, but now distribute goats, pigs, rabbits, chickens, water buffalo, ducks, and so on, in a veritable Noah's Ark of help. Even in Africa, the cost of a cow or goat can exceed a year's income. A breeding pair provides milk and meat, but more importantly a source of income as the family can sell the offspring. The recipient must agree to give one breeding pair of offspring away to someone else, thus paying the gift forward. A small amount of money contributed now will multiply manifold as families are given food, pride, a source of income, and the means to help someone else. It's hard to imagine a more practical, more proven, more global, more powerful lever in making a difference in communities of need than this one.

HEIFER PROJECT INTERNATIONAL
PO Box 8058,
Little Rock, AR 72203.
800/422-0474,
www.heiferproject.org

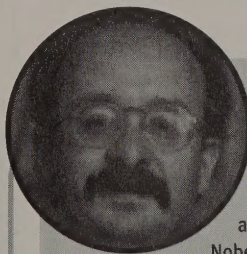


Jay Kinney was a *Whole Earth Review* editor 1983-85. American culture is racing today to catch up to the understanding he brought to a special issue, "Islam: Beyond Stereotypes," in 1985 (see page 83). He founded and published *Gnosis* for fourteen years, with the collaboration of wife **Dixie Tracy-Kinney**, and edited our "Beyond Left and Right" feature section in the Summer 2000 *Whole Earth*.

Egypt Lost and Found is one of the most stunningly beautiful books I've ever seen. I saw a friend's copy and knew, within about ten seconds, that I had to get my own copy. It tells the story of Europe's exploration of Egypt, accompanied by over a thousand color reproductions of old lithographic prints. —Jay

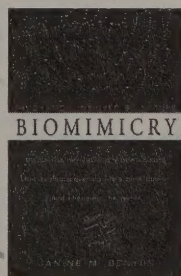
Pop an **Aroma Wrap** into the microwave for a couple of minutes and then wrap it around your neck. As we all get older and our muscles get stiffer, this item is perfect for nighttime reading in bed. My mother sent me one for Christmas, and it was immediately commandeered by Dixie. Need I say more? —Jay

After leaving the \$40 pair of **Russian Opera Glasses** I bought at the S.F. Opera House in a cab one night, I went online looking for a replacement pair. I swear, these are the same glasses for half the price. My one complaint is that I ordered the \$19.99 black pair and, being out of those, they sent me the more expensive white ones at no extra cost. These are of course not super high-quality glasses, but are very serviceable and petite. Perfect for improving the view from the balcony with a minimum of fuss and expense. —Dixie



Amory Lovins cofounded and serves as Chief Executive Officer for Research of Rocky Mountain Institute. A recipient of both a MacArthur Fellowship and a Right Livelihood ("Alternative Nobel") award, he has authored or coauthored twenty-seven books, including *Natural Capitalism* with Hunter Lovins and Paul Hawken, and consults for industries and governments worldwide. He has been called "one of the Western world's most influential energy thinkers."

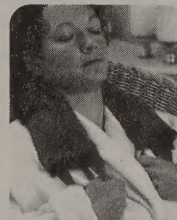
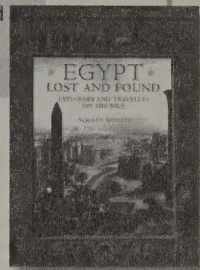
With clarity and grace, *Biomimicry*, by Janine Benyus, illuminates how 3.8 billion years of design experience—many experimentation and rigorous testing, in which the 99 percent that didn't work got recalled by the Manufacturer. It offers life-friendly solutions to human needs.



Led by Dr. Willie Smits, the **Balikpapan Orangutan Society** is doing vital, urgent, careful work in eastern Borneo, trying to save orangutans and their habitat from imminent extinction.

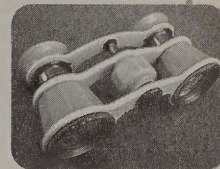
BIOMIMICRY
Janine M. Benyus
1998; 320 pp. \$14
William Morrow & Co

EGYPT LOST AND FOUND
Explorers and Travelers on the Nile
Alberto Siliotti
1999; \$32
Stewart, Tabori & Chang

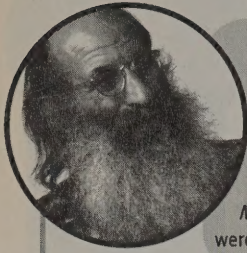


AROMA WRAP
\$17.95 (\$24.90 postpaid;
\$40.90 postpaid for two)
Gardener's Supply
Company, 128 Intervale
Road, Burlington, VT
05401. (800) 551-6712,
(802) 660-3505,
www.gardeners.com

RUSSIAN OPERA GLASSES
\$19.99 (\$25.98 postpaid)
Lan Optics International,
15 Sparhawk Drive,
Burlington, MA 01803.
800/613-0331,
781/229-6096,
www.russianoptics.com/binoc4.html



BALIKPAPAN ORANGUTAN SOCIETY (BOS-USA)
PO Box 2113, Aptos, CA
95001. www.orangutan.com



Malcolm Margolin is publisher of Heyday Books, our favorite regional book company, and the quarterly *Notes from Native California*. His own *Earth Manual* and *The Ohlone Way* were instant bioregional classics.

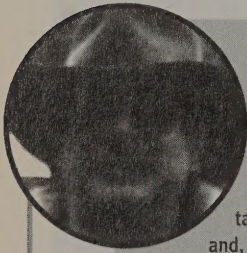
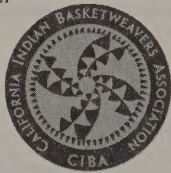
I'd love to give any of dozens of objects from **Pacific Western Traders**. For thirty years now, Herb and Peggy Puffer have run this trading post specializing in California Indian art—basketry, jewelry, modern paintings, traditional crafts. The quality is superb, and by offering a unique outlet many of these arts have been kept alive and even expanded.

For donations, consider the **California Indian Basketweavers Association**. This native-run group holds an annual gathering, advocates for the rights of basketweavers to collect material, fights pesticide use on places where weavers gather raw material, and otherwise supports and promotes one of the world's great art forms.



PACIFIC WESTERN TRADERS
305 Wool Street, Folsom,
CA 95630. 916/985-3851,
www.pacificwesttraders.com

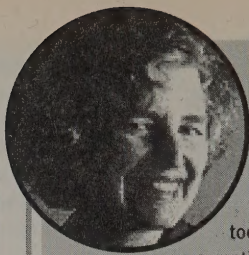
**CALIFORNIA INDIAN
BASKETWEAVERS
ASSOCIATION**
PO Box 2397, 317 Spring
Street, Nevada City, CA
95959. www.CIBA.org



JD Smith goes back at least twenty-five years at *Whole Earth*, having at one time or another run the Whole Earth Truck Store, guest-edited the catalog and the magazine, and written tight, gritty reviews and short tall tales. He lives in Weston, Oregon and, among other jobs, manages the Oregon East Symphony orchestra.

Go to a hardware, lumber, plumbing (Home Depot even) type place and buy two ten-foot sections of half-inch PVC water pipe, (ten bucks maybe) and fifteen bucks worth of fittings (tees, couplers, 90s, 45s, 22-1/2s, caps, a little of everything) then use a hacksaw or some other fine-toothed device to cut the pipe into sorta foot-long pieces. Take the burrs off the cuts with a pocket knife or sandpaper or fingernail file. Box up the works and give it to a three-to-five-year-old. Introductory Plumbing Sculpture Kit.

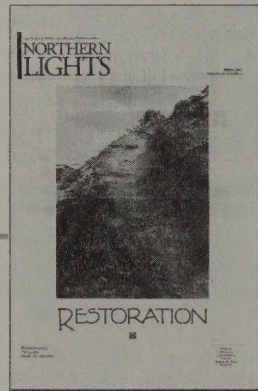
The best nonprofit that I don't work for is Northern Lights, publisher of *Northern Lights*



Vicki Robin is president of the New Road Map Foundation (www.newroadmap.org), an all-volunteer, nonprofit foundation teaching people tools for shifting to low-consumption, high-fulfillment lifestyles. With Joe Dominguez, she is coauthor of longtime *Whole Earth* favorite *Your Money or Your Life: Transforming Your Relationship With Money and Achieving Financial Independence*.

There are two books I'm spreading around these days: *Nonviolent Communication*, by Marshall Rosenberg, is a magnificent tool for a process of communicating that fosters and maintains a heart connection—no matter what. You can learn it from the book or attend a workshop—there's an international network of trainers through the Center for Nonviolent Communication. I thought I was ever so loving and compassionate until I started using those tools and really took down my walls. *No More Throw-Away People* turns money on its head as a social artifact, showing “poor” people that they have tradable wealth. Being a creator of money—whether through Cahn's system or other “barter” systems—puts one at the source of changing what's wrong with our world.

As far as gifts I like receiving, **flowers** are it! Are they a tool? Depends on whether you think beauty is necessary for the soul. I'm just as happy with “stolen” garden escapees growing in back alleys as with purchased bouquets.



magazine—*Paris Review* meets *True West*. Nicely edited, no advertising, solid literary access to contemporary “western” issues without any of the “my heart races at the sight of a tree” stuff that is bogging down much modern environmental writing.

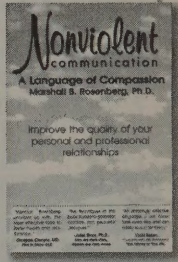
NORTHERN LIGHTS RESEARCH AND EDUCATION INSTITUTE

One-year subscription (four issues) to Northern Lights free with donation of \$25 or more to Northern Lights Institute, PO Box 8084, Missoula, MT 59802. 406/721-7415

The Center for a New American Dream is one of the premier organizations that is challenging the level and pattern of consumption in North America and offering a “more fun, less stuff” strategy as one alternative. Through their website you can find a full range of initiatives to offer volunteer hours to.

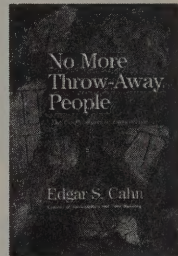
**NONVIOLENT COMMUNICATION
A Language of Compassion**

Marshall Rosenberg
1999; 210 pp.
17.95 (\$21.95 postpaid;
including additional Center
for Nonviolent Action materi-
als if ordered through website
or toll-free number below)
PuddleDancer Press, PO Box
231129, Encinitas, CA 92023,
877/367-2849,
www.puddledancer.com

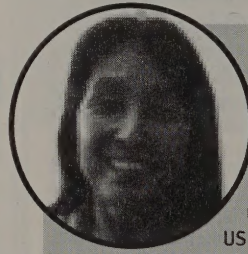


**NO MORE THROW-AWAY
PEOPLE**

The Co-Production Imperative
Edgar S. Cahn
2000; 212 pp.
\$17.95
Essential Information

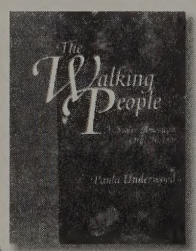


**CENTER FOR A NEW
AMERICAN DREAM**
6930 Carroll Avenue, Suite 900,
Takoma Park, MD 20912.
www.newdream.org



Mayumi Oda, a longtime Point Foundation friend and former board member, is an exquisite, lyrical, graphically arresting painter, as well as peripatetic anti-nuclear campaigner in the US and Japan. Her *Goddesses*, reprinted on bamboo paper, is available for \$40 postpaid from Editions Gaia, 1795 Shoreline Highway, Sausalito, CA 94965, fax 415/383-6614.

The Walking People, by Paula Underwood, tells a 10,000-year history through the eyes and words of Native American people. Especially during trying times, it resonates with wisdom, goodness, respect for community, and people's kindness for each other.



**THE WALKING PEOPLE
A Native American
Oral History**
Paula Underwood
1994; \$28
Tribe of Two Press,
PO Box 133, Bayfield,
CO 81122. 800/995-3320,
www.tribeoftwopress.com

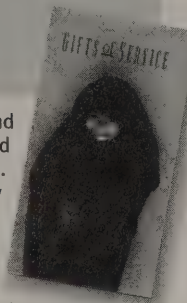


Howard Rheingold edited the *Whole Earth Review* from 1990 to 1994, along with the *Millennium Whole Earth Catalog*. His seminal books *They Have a Word for It: A*

Lighthearted Lexicon of Untranslatable Words & Phrases; Tools for Thought; and The Virtual Community have all been recently reissued, the latter two in revised editions.

Seva is a worthy cause, and most of the money you send goes directly to helping people. Founded by Ram Dass, Wavy Gravy, and Larry Brilliant (cofounder of the WELL), it concentrates on curing blindness in Asia and also does public health work with Mayans in Guatemala. See their "Gifts of Service" brochure, which allows you to direct your donation to the project you want to support (from \$30 to restore the sight of a blind nomad in Tibet to \$20,000 for a clean water system for a Guatemalan community). Seva then sends a card to your recipient describing the gift given in their honor.

SEVA FOUNDATION
1786 Fifth Street,
Berkeley, CA 94710.
510/845-7382,
www.seva.org



Cathrine Sneed founded the Garden Project, which works with San Quentin prisoners and former inmates through "horticultural therapy," using urban gardening work that gives opportunity and dignity while providing food for homeless people, institutions, and schools.

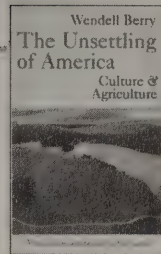
I'd recommend anything by Wendell Berry, because he reminds us that what ails us psychically and physically as a people cannot be divorced from how we treat, and our relationship with, our natural environment.

Organizations to support:
Hunter's Point Youth Foundation
and **Mission Education Foundation, Inc.**

THE UNSETTLING OF AMERICA
by Wendell Berry
1996; 234 pp.
\$12. Sierra Club Books

HUNTER'S POINT YOUTH FOUNDATION, INC.
200 Middlepoint Road, San Francisco, CA 94124.
415/285-1415

MISSION EDUCATION FOUNDATION, INC.
3049 24th Street
San Francisco, CA 94110. 415/282-9898



Charlene Spretnak's many books include *States of Grace: The Recovery of Meaning in the Postmodern Age* and *The Resurgence of the Real: Body, Nature, and Place in a Hypermodern World*. She cofounded the Green Party movement in the US.

For single parents and anyone else who puts in long days without much assistance, give a **gift of time**. Draw a few coupons that are each worth four or so hours of your taking the child(ren) somewhere or else babysitting at their home.

For elderly persons still in their home or for anyone struggling with a long illness, give a **gift**

of labor—perhaps a thorough "spring cleaning" or painting the walls or other needed maintenance, indoors or outdoors.

For "electronic children" being raised on too much TV, computers, videos, and video games, give a **gift of being in nature**. Offer to take one or more children to a park or nature preserve a few times and show them how to listen to and watch our relations.



David Rothenberg, a musician, producer, writer, and teacher, is editor of *Terra Nova*, formerly a premier journal of nature and culture and now a book series from MIT Press; the most recent volume is *Writing on Water* (see page 38).

The Story of Yew, by Guido Mino di Sospiro is essentially an autobiography of a 2,000-year-old yew. It's a unique account of a few millennia of human history as observed by...a tree! She witnesses the coming and going of human generations, the increase and decrease of knowledge, listening and observing. A charming eco-fiction, somewhere between Italo Calvino and Jean Giono. Instead of a man who planted trees, here is a tree who shakes her leaves at our kind.

The **Cornerstone Theater** was founded by my good friend Bill Rauch just after we graduated from college in the mid-1980s. It is one of the most unusual and genuinely down-to-the-ground arts organizations in America. From 1986 to 1992 they traveled all across the country, putting on adaptations of

classic plays in tiny communities that otherwise never got a whiff of theater. Since 1992 they have settled in Los Angeles, committed to putting on adaptations and new contemporary works in that city's many multi-ethnic neighborhoods and communities. If you thought theater was elitist or even dead, look again. The canon has never been a one-way street...

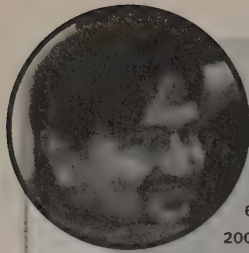
THE STORY OF YEW
Guido Mino di Sospiro
2001; 173 pp.
\$19.95. Findhorn Press

CORNERSTONE THEATER COMPANY
708 Traction Avenue, Los Angeles, CA
90013. 213/613-1714,
www.cornerstonetheater.org



Stephanie Mills, a longtime *Whole Earth* editor and contributor, now writes and practices bioregionalism in Maple City, Michigan. Her next book, *Epicurean Simplicity*, is due in February.

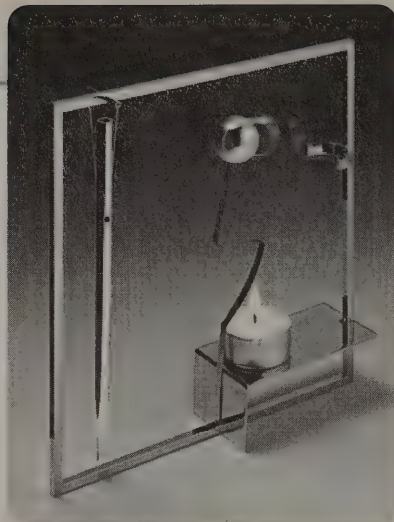
Most years, I wind up enjoying gift-giving at the holiday season, but when I'm broke it appalls me because I can't seem not to do it. The friends and family on my guest list don't need any more things, really, so I'll either give a well-chosen book or some little item from a locally owned or right-livelihood business. I also give subscriptions to periodicals I support, like *Whole Earth* or *The Nation*. A couple of years ago, I gave to the **Heifer Project** (see page 7) in the names of my well-off Republican relatives and got the dearest thank-you note from my uncle. In it, he mused drolly about the fate of the ducklings I'd donated, hoping they'd enjoy life.



Bruce Sterling, science fiction writer and impresario of the Viridian Movement (www.viridian-design.org) was guest editor of the Summer 2001 *Whole Earth*.

I quite like the **Little Vibes**. This Dutch hand-made design is a magical combination of movement and sound. The heat of a candle expands and contracts the bi-metal stem, causing the little brass ball to dance back and forth, irregularly ringing the chime. This finely tuned and precisely balanced design is made of brass and nickel-plated brass. The tone is pleasant and its movement has a nice chaotic rhythm. There's also something quite priapic about the way this flame-heated, round metal ball keeps lunging doggedly for that chime, finally nailing it with a series of banging throbs. A great desktop toy for that hormone-powered special guy in your life.

For an organization, the **Electronic Frontier Foundation**. It's no longer a frontier, but the internet sure is screwed up this season. Until somebody invents the Electronic Shambles Foundation, these valiant guys and gals will have to do.



THE LITTLE VIBES

\$125.55 postpaid
Gift Mall, PO Box 15977, 1001 NL Amsterdam, The Netherlands. www.gift-mall.com/gm/vb/

ELECTRONIC FRONTIER FOUNDATION

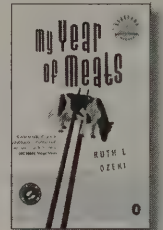
454 Shotwell Street, San Francisco CA 94110. 415/436-9333, www.eff.org



Andy Weil, M.D., a member of *Whole Earth's* editorial board, is clinical professor of medicine and director of the Program in Integrative Medicine at the University of Arizona. His most recent best-selling book is *Eating Well for Optimum Health*. His website, www.drweil.com, receives about a million hits a day.

My Year of Meats, by Ruth Ozeki, is offbeat, funny, and incisively critical of American dietary and agricultural practices.

The **NIMC (National Integrative Medicine Council)** is a new not-for-profit designed to mobilize grassroots support for integrative medicine nationally.



MY YEAR OF MEATS

Ruth L. Ozeki
1998; 367 pp.
\$12.95
Penguin

NATIONAL INTEGRATIVE MEDICINE COUNCIL

5151 E. Broadway, Suite 1095, Tucson, AZ 85711. 520/571-1110, www.nimc.org



Hardin Tibbs articulated the theory of industrial ecology (*Whole Earth Review*, Winter, 1992). He is managing director of Ecostructure, based in Canberra, Australia, a consulting firm specializing in strategies for sustainability, and is an associate of the Global Business Network.

Our culture's absorption in things has reached saturation point. I would look for a no-thing gift, or minimal-thing gift that conveyed the feelings of the giver in a symbolic, imaginative, and original way. For an organization to donate to in lieu of giving things, I'd recommend **Amnesty International** or the **Rainforest Action Network**.

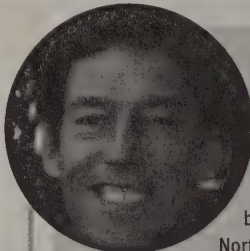
AMNESTY INTERNATIONAL

In the US: 322 8th Avenue, New York, NY 10001. 212/807 8400, www.aiusa.org. For other countries, see www.amnesty.org



RAINFOREST ACTION NETWORK

221 Pine St., Suite 500, San Francisco, CA 94104. 415/398-4404, www.ran.org



Seth Zuckerman is the first Ecotrust Circuit Rider, gathering stories about conservation-based development in the rain forest bioregion of the Pacific Northwest coast. He chairs the board of the Mattole Restoration Council, and is coauthor of *Salmon Nation: People and Fish at the Edge*.

An **apple peeler-corer-slicer** is an ingenious tool, not a machine. I got mine (from Back to Basics of Sandy, Utah) at a local hardware and households store for about \$20. You impale the apple on a three-pronged claw and turn a crank to propel the apple past the form-fitting peeler knife (which can be tucked away if you want to leave the peel on), through the corer, and into a blade that slices the apple into a neat spiral. Your intended recipient doesn't have enough apples to warrant a peeler-corer-slicer? Consider giving a fruit tree. With the development of dwarf root stocks, you can choose between trees that can be kept as small as a beach umbrella or that can grow as big as a cabin. Espalier saplings can spread their branches along fences for narrow side yards. Also available are grafted trees that provide several varieties off the same trunk—an excellent way to prolong the season with early, medium, and late varieties of the same fruit. The turn of the year is the time to order trees, while they are in their winter dormancy.

Habib Koité & Bamada, a CD entitled *Ma Ya*—dreamy, entrancing music from Mali. It's

rich and engaging to listen to, but subtle enough that you can play it in the background while talking or working.

In these days of global uncertainty and media spin, a shortwave radio receiver would let your recipient hear what the rest of the world is saying about events, not just the version filtered through a handful of media conglomerates that control the news in America.

What I want someone to give me: *Prodigal Summer*, by Barbara Kingsolver.



PEEL AWAY APPLE PEELER

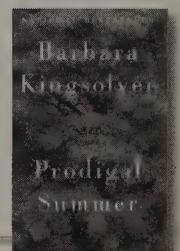
Back to Basics
Sandy, Utah
\$20

MA YA

Habib Koité & Bamada
1999; CD
\$15.98. Putumayo Records

PRODIGAL SUMMER

Barbara Kingsolver
2001; 464 pp.
\$14.
HarperPerennial



Giving Yourself

Here are a few ways to connect with organizations looking for volunteers. Check their websites or call ahead before showing up. —MKS



SEVA (SEE ACCESS PAGE 9)

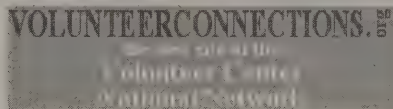
Seva used to depend largely on doctors and other volunteers in its Asian sight-restoration and Mayan renewal programs. It now believes that the money it once spent flying in helpful Westerners can be better used to train local professionals to work in their own communities, but it still has some needs for health and management experts who can pay their own expenses and for volunteers and interns for a variety of office tasks.



VOLUNTEERMATCH
www.volunteermatch.org

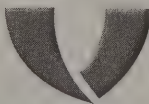
Type in your zip code and the radius within which you're willing to travel, then chose from

one of twenty categories (or "everything"). I found nearly a hundred volunteer options within ten miles of our offices, ranging from tutoring to grief counseling to guide-dog training. You can also post info about your organization's needs for volunteers.



VOLUNTEER CENTER NATIONAL NETWORK

The Points of Light Foundation
1400 I Street NW, Washington DC 20005.
202/729-8000.
www.volunteerconnections.org



INTERNATIONAL ASSOCIATION FOR VOLUNTEER EFFORT

Same address
www.iave.org/directory1.cfm

Growing numbers of communities now sponsor volunteer centers, with professional staffs skilled in matching volunteers and opportunities. The National Network's website lists hundreds of volunteer centers across the country. The IAVE website includes a directory of volunteer centers in nearly eighty countries.

Consumerism-free Holidays

Alternatives for Simple Living emerged nearly thirty years ago as a Christian protest against the commercialization of Christmas. It's now expanded to a year-round organization providing resources in English and Spanish for making consumerism-free, guilt-free zones out of non-Christian and non-religious celebrations as well (birthdays, marriages, Bar/Bat Mitzvahs, Kwanzaa, national holidays). See especially their *Treasury of Celebrations*, a compendium of the best of their *Alternative Celebrations Catalogues*. —MKS

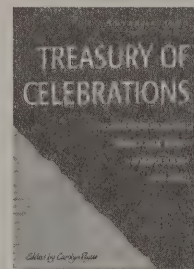


ALTERNATIVES
FOR SIMPLE LIVING

ALTERNATIVES FOR SIMPLE LIVING
5312 Morningside Avenue, PO Box 2787,
Sioux City, IA 51106. 800/821-6153, 712/274-
8875, www.SimpleLiving.org

**TREASURY OF
CELEBRATIONS**
Create Celebrations
That Reflect Your
Values and Don't
Cost the Earth

Carolyn Pogue, ed.
\$12 (\$19.20 postpaid)
from *Alternatives for
Simple Living*
(see access above)



Alternatives to the Peace Corps

I wish I had had this book with me on my travels! Food First made this idealist's bible for every dreamer, volunteer, experienced or unexperienced, well-seasoned or first-time traveler who wants to do something good in the world. (without necessarily joining the Peace Corps). Listings of more than 100 Voluntary Service Organizations as well as alternatives to travel and studying overseas. From Africa to South America to Asia, from organic gardening to teaching English to building houses—details about the projects as well as contact info and costs. The organizations are supported by local grassroots efforts with minimal or no governmental ties. —EP

“ Global Volunteers
375 East Little Canada Road
St. Paul, MN 55117-1627
www.globalvolunteers.org

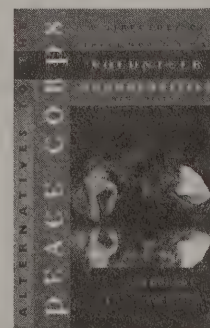
Global volunteers forms teams of volunteers who live in host communities and work with local people on development projects selected by

local leadership. The projects may involve construction and renovation of schools and clinics, health care, tutoring, business planning, or assisting in other local activities. Opportunities are available in Africa, Asia, the Caribbean, Europe, Latin America, and the Pacific Islands. Volunteers are of all ages and come from all different backgrounds and occupations, including teachers, carpenters, homemakers, physicians, and artists. No special skills or languages are required. Tax deductible program fees range from \$450 to \$2,395 and include costs of training, ground transportation, lodging, project materials, all meals, and an experienced team leader.

“ ACORN
88 Third Avenue, Brooklyn, NY 11217
718/246-7900
www.acorn.org

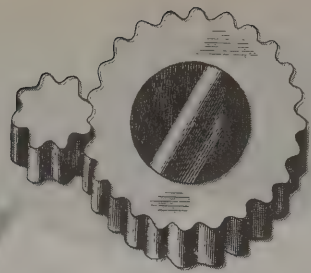
ACORN (Association of Community Organizations for Reform Now) is a neighborhood-based, multiracial membership organization of low-income families working to gain power

within institutions that affect their every day lives. Volunteers work as grassroots organizers throughout the US. They receive a salary and must commit to one year of service. A working knowledge of Spanish and previous organizing experience are preferred, but not required.



**Alternatives to
the Peace
Corps**
A Directory of
Third World & US
Volunteer
Opportunities 9th
Edition

Joan Powell, ed.
2000; 116 pp.
\$9.95
FoodFirst Books



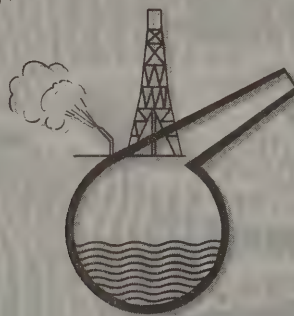
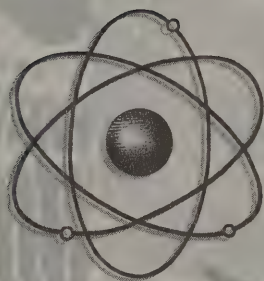
Then there is electricity, the demon, the angel, the almighty physical power, the all pervading intelligence!



Left:
Thomas
Edison



Quote from
Nathaniel
Hawthorne,
*The House
of Seven
Gables*



Logos of energy
modes:
nuclear, thermal,
mechanical, electrical,
solar, and
(bio)chemical.

an electric dragon mantles the north american continent.

From a satellite, at night, the dragon glimmers with luminescent scales. Its hunger feeds its nerve net, crackling with sparks and current, and exhausting itself in the furthestmost extensions of its voltage-webbed body—in the lamps, radiators, and refrigerators of millions of homes, and in

the motors and machines of thousands of factories and businesses.

The Electric Dragon has hundreds of mouths consuming uranium, coal, diesel, natural gas; stuffing itself by boats, trains, and pipes from all over the planet. It belches steam, leaks hot water, and exhales various querulous gasses. After digestion, ash and nuclear dung remain for the waste stewards. It's been impossible for any human mind to grasp the complete anatomy and shape of the dragon. Few can even answer simple questions of electronic Zen: When I flip on the light switch, where does my electricity come from?

Some focus on a single fingernail of photovoltaic plates that flickers with absorbed and reflected sun. Some see one of the dragon's tiny windmill tails whipping in circles. Some work hard to reinforce the nerve net with new high-voltage lines, while others run from the dragon's high-voltage grid and attempt independence.

And we humans, mere Lilliputians, try to tame the dragon that we both created and evolved within—an architecture of nature, industry, and citizens with only momentary outbursts of design intelligence.

The dragon continues to sprawl further and further as we squabble over how to reorganize its mouths, nerve net, and scaly luminescent skin. There is discontent in the Kingdom. Top-down industrial and regulatory leaders have shown little imagination about how to quickly domesticate a cleaner, more secure, more reliable, more affordable, and less harmful electronic beast. Given the urgency, their schemes—be it in markets or government rules—founder like overheated lines and set off local fire-sales of power plants, as in California.

In moments as chaotic as this, I like to step back and remember my childhood. In the dark, we rubbed together two stones found by a creek, and, at seeing them spark, gave up little gasps of rapture. Subtle fire. Friends with rotating disks of silver foil sent little lightning bolts between iron balls; the Jacob's ladder shot crackling static electricity up a Y-shaped conductor. We dared friends to touch the gleaming ball at the Children's Museum that set your hair on end; wowed at the electric eel discharging itself in the aquarium. These sparks (dragon seeds, not threatening, but benign beauty in the dark) contrast now with high-voltage controversies over electric chairs and power/energy moralities, or anger over a bent wire shutting down a nuclear power plant and conjuring meltdown.

In March 1989, the cosmic/Earth connection

“I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that.”—*Edison*

came home and imbedded within me an electronic humility. On March 9, 1989 a cloud of solar gas thirty-six times the size of the Earth exploded out of the sun at a million miles per hour. The solar storm tangled with our magnetosphere. On March 13, from sunset to sunrise, Alaska and Scandinavia shimmered with spectacular auroras. A jet stream of electrical current flowed around the Earth about 60 miles above ground. The Sun's vast electromagnetic transmission spun off smaller electrical currents. One found an entrance point into North America's Electric Dragon through the Hydro-Quebec Power Grid. The entire Quebec power grid collapsed for seven hours. The dark and cold and fear came from a mere sigh of this more cosmic Electromagnetic Dragon (a sigh that scientist-prophets predict will reoccur and cause havoc about every ten years).

From out of that solar storm, the ghost of Thomas Edison returned to American history. First his words: “I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that. I wish I had more years left.” Then his struggles with his protege Sam Insull, in which Sam took the build-big approach: big power plants, alternating current for long-distance delivery, big transmission lines and transformers, big service areas, “natural” monopolies.

Edison essentially, intuitively, but ineffectively, countered: local small infrastructures are best. Humans, he understood, with their limited organizational skills and limited powers to foresee how technology can take revenge, would best be served by local grids and local power plants. Edison, the counter-sorcerer, scares the sprawling Electric Dragon even today.

If I was going to write the above in WorldWatch prose (see *Micropower*, page 20), I would overwhelm you with facts: “More than 75% of the world's energy supply (and more than

85% in the US) comes from burning coal, oil and natural gas." "The worst centralized power plants waste as much as 66% of the energy they produce." "Energy supply is the source of most human exposure to air pollution, acid rain, much of toxic contamination of ground water, most of radioactive wastes, most of human-influences of climate." "Failures in distribution lines account for 95% of US electricity outages." "Unreliable power costs businesses and consumers up to \$50 billion a year." "US transmission and distribution expenditures have exceeded those of generation since 1994." "Transmission and distribution losses equal about 20 percent of power in India and Sri Lanka, more than 30 percent in Bangladesh and Nigeria, and over 50% in Benin and Haiti." "US subsidies for thermal power plants exceed \$120 billion per year." "1.8 billion humans have no electricity and cannot afford to build a centralized

electricity network."

The Electric Dragon appears heading to extinction. The central-station-and-grid design can no longer provide cheap and reliable power. It suffers from over-extension, congested grids, wasted heat, unreliable delivery, polluting power generators, and relies on perverse subsidies.

Once assumed to be as powerful as the sun, the Dragon anticipated radiating its power over all the territory from Mexico to Canada with impunity. But blackouts in New York, the Pacific Northwest, and Ontario mercilessly made clear the downside of being widely wired.

Completing Edison's Legacy

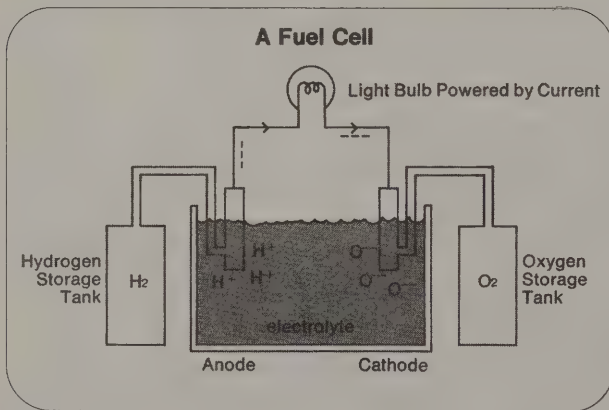
The habitat of the Electric Dragon, the world, is abruptly changing course. As with the oversized mammoth or Pleistocene elk, when habitats change the biggies go first. The wolf before the coyote; the

Negawatts

Amory Lovins was not wrong. Efficient appliances, transmission lines, and refurbished power plants have produced more electricity than building new power plants. But America has gone lazy, and some utilities want to sell as much power as possible. Forty-nine states reward utilities for selling more electricity and penalize them for lower bills. Still, the negawatt crusade continues with "intelligent" rooms that will shut off lights if no one is there, better fluorescents, and, especially, better motors (motors eat up two-thirds of electric deliveries worldwide. (See www.rmi.org).

coyote before the house cat. First to go have been Big Mouth power plants (mostly nuclear greater than 1,000 megawatts). They peaked in size and efficiency in the 1970s and then headed for the global dump-

DISTRIBUTED POWERS



FUEL CELLS

Fuel cells are really rechargeable batteries in which the recharging is done with hydrogen. They are three to 100 times more powerful per kilogram of weight than rechargeable portable batteries, and ten to one hundred times more energetic by volume. This is new technology with high costs. The source of hydrogen can be nuclear, coal,

or renewables. The balance sheet on environmental impacts depends on fuel/power source. Methanol and natural gas are currently the hot prospects. Fuel cells themselves are pollution-free, noise-free, 20- to 35-percent more efficient than fossil-fuel generators, with no moving parts. Hydrogen storage and transport infrastructure remain a cost barrier. Great effort is now directed toward rechargeable hydrogen fuel cells for cars.



SOLAR PVs

Arizona, Nevada, and New Mexico are top locales for solar. The generation of electricity from sunlight is benign, but the fabrication of solar panels from silicon produces volumes of greenhouse emissions and is expensive. Batteries for nighttime and peak uses need improvement. Solar systems improve and costs drop every month; they are very cost-effective where no grid exists. Net metering will help reduce costs for those attached to the grid.

ster. In the 1980s, the big power generators starved. America's most symbolic substitute for energy—money—found them too expensive. By the late 1980s, the dragon's terrain has been invaded by new critters, little animated electrical dynamos that fit better into human society and planetary hope—solar PVs, wind turbines, microhydro generators, microturbines, Stirling engines, small wave generators like “bobbing ducks,” and truly botanical biofuel power plants. Like the earliest tiny mammals among the dinosaurs, they have found a niche. The new power plants will be smaller, modular (they can enter the energy web with less investment and shorter lead times), can fit into the landscape with less disruption, waste less fuel/energy/heat, and behave more as symbionts than predators. That is, they do less harm to the ecosystem and biosphere, especially its human inhabitants.

Some of these little animated

dynamos have become multifaceted. Solar shingles and roofing tiles now can serve as both roof and electric generators. Heat from boilers no longer wastes itself into the atmosphere, but generates both electricity and heat for industry and homes (cogeneration). Windmills on farms are not just to pump water, but also to feed the local grid. Compared with the single-purpose crank-it-out generators of yore, the new “energy species” have gained complexity.

It is as if power consciousness moved from an image of an ecosystem dependent on a few large lakes to an ecosystem of many small lakes and ponds. For water or electron flows, there were definite advantages to satisfying thirsts with many dispersed sources rather than a few big ones. If a large lake dries up or becomes undrinkable, then the whole system suffers immediately. Big power plants meant big disasters (e.g., Chernobyl). If small lakes

dry up, one at a time, then there is no system crash and there is time to reorganize for the water (or electron) drought. This “distributed intelligence” has not been part of the ol' Electric Dragon's modus operandi. Given the higher profile of terrorism, local and regional minds now contemplate less webbing and new reconfigurations. To increase national security the small-lakes-widely-dispersed approach seems wiser (see *Brittle Power*, at www.rmi.org).

The Energy Section

This issue of *Whole Earth* looks at “micropowers” (Seth Dunn's bon mot; see page 20) that have been reconfiguring the Dragon's nerve net into “distributed energy.” In the runner below, we provide the quickest field guide to all the invasive dynamos that have stayed between 3 and 10,000 kilowatts and dispersed themselves so that any one break in the web will not shut down all the



WIND TURBINES

When the wind blows, per-kilowatt cost equals that of natural gas plants. But sometimes the wind does not blow, so production is intermittent. Wind is less valuable than natural gas, which can be adjusted quickly to demand without the need for batteries and energy back-up. Near-shore wind generation may replace on-land generation. This would eliminate wind's three problems: aesthetics, land use, and noise.

GEOTHERMAL

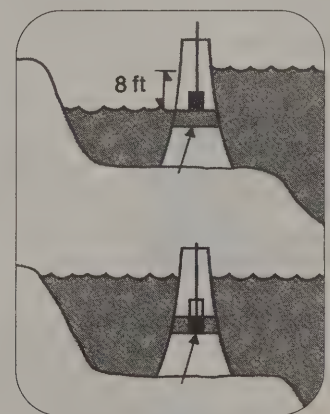
Geothermal energy comes from steam heat in deep Earth. Wells, up to one to two miles deep, bring up hot (up to 700°F) water. Now a mature technology whose costs are comparable to electricity from coal plants. Hopes to tap deeper sources and increase efficiency. Regionally important.



TIDAL

Tidal energy can be tapped by building a dam containing turbines across a bay or ocean inlet, creating a water-level difference between the bay and ocean. Clean, dependable, and inexhaustible, but limited

(represents only 2 percent of available hydropower), with, at times, severe enviro impacts.



WAVE

To convert wave action to useful energy, the waves must drive something like turbine blades or pistons. Recently, six models have claimed to be cheaper than nuclear, coal, and wind. The oscillating water column

regional electron shuffling.

The end result will be a reinvigoration of "community"—a less sprawling electronic tangle of cities, and the beginning of more regional and local care for electric power. With oddball names like "aggregators for community choice," towns and smaller cities have joined forces to buy electricity in ways they want: a portfolio with ever-increasing green renewables, a long-term contract somewhat immune from oil cartels and time-of-day price fluctuations, stranded costs paid by the responsible parties (see below), increased revenues tied to decreased costs per kilowatt-hour rather than sales of more and more electrons, and guaranteed "umbilical" rights for customers to feed the electric web from home or business as well as to feed off the grid when in need (page 28). Massachusetts and Ohio have been the reconfiguration path breakers.

In short, just as our rivers have undergone scrutiny—with some

Micropowers and Distributed Energy will return the electric web to regions and cities. Bigness has hit its limits. First, bigger was better. Thermal power plants went from 80 megawatts (1920); to 600 mW (1960); to 1,400 mW (1980s). By then, reliability, blackouts, brownouts, voltage fluctuations, pollution, power plant water costs, long payback times, stranded costs that punished those already on-line, and expensive transmission stopped gigantism. In the mid-1980s, new power plant sizes began to shrink: down from 200 mW to 100 mW by 1992; to 21 mW by 1998. Soon, "Edison-sized" micropower (5 mW or 1903-size) may be common. New efficient, more profitable, modular power systems may prove "small is really beautiful."

NON-RENEWABLES

"prototype" now operates in Scotland.

World shorelines have been mapped for kW/meter and environmental impacts are under study. Wave action power generators do best in 300 to 600 feet of ocean where there is a long wave-fetch.



BIOMASS GASSIFIERS

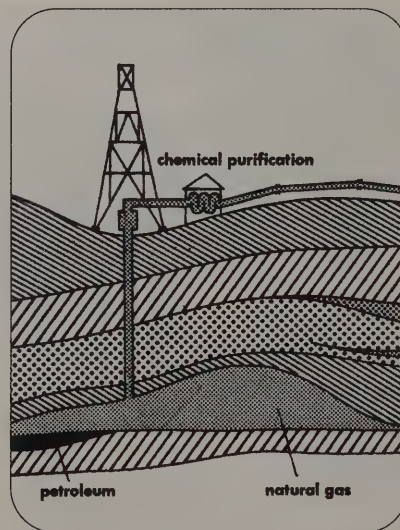
Burning trees, crop residues, manure, and other biomass for power is a mature tech. Its future is bioregional. In arid regions, there is too little biomass to sustain energy production or the biomass requires too much water. In cities, municipal solid waste is still not cost-competitive in today's perversely subsidized markets. There are also serious concerns about emissions and heavy metals.

NATURAL GAS

Natural gas is the immediate darling of the power industry: cheaper, lower emissions than coal, abundant. Combined with jet engines, it could provide more kWh than all other competitors. Adverse land and water impacts parallel coal and uranium development.

HYDROELECTRIC

Once constructed, hydro is cheap and instantaneous, making it ideal for power surges. But water releases must be timed for farms and fish, compromising its utility as a just-in-time electricity generator. Has very serious impacts on riparian, delta, and in-stream ecology; and displacement of residents. Costs also limit "new" hydro dams, pumped storage schemes, and microhydro.



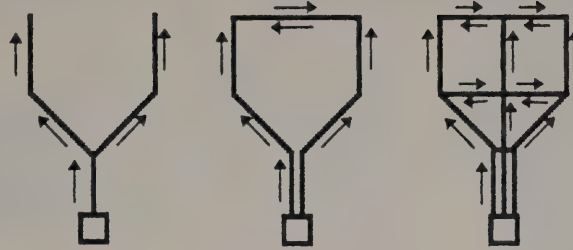
COAL

More than 70 percent of the US West lives off coal which is primarily responsible for smog, climate-change gases, and health issues from particulates and other pollutants. Unless cleaner tech for coal evolves soon, coal will have a hard time in a market place that includes the cost of emissions control.

deconstruction of dams and rescheduling of water releases to benefit fish and fishermen as well as farmers and electricity—so the rivers of electrons have come under entrepreneurial and ecological eyes. Until the Bush administration, big thermal power plants, especially nuclear light-water reactors and dirty coal plants, were being decommissioned or given limited lifespans, but the Bush reversal will be temporary, because of reliability, safety, and cost considerations. Meanwhile, line owners and regulators have been changing the rules of “wheeling” (the shifting of electric currents around the electric web) to allow micropowers to join the disarray.

Let’s not get too Harry Potter about this. Most Americans simply want a reasonable Dragon, not necessarily a dead one. They want max self-reliance, with high-quality and reliable power. Only a few hipsters and libertarians want total off-the-

Power Delivery Designs

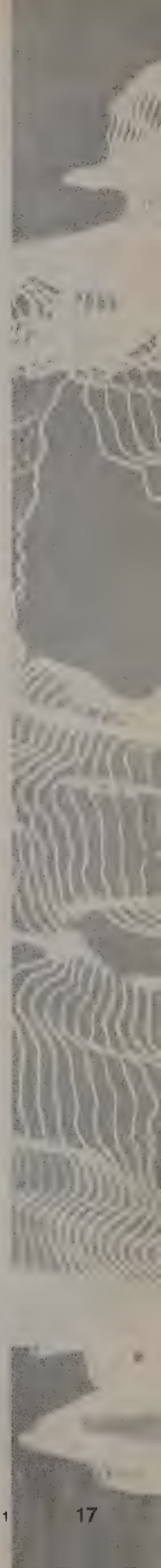


grid self-sufficiency. In the near future, the Dragon may serve to top off electricity needs during peak need, or serve as a back-up for times when something goes wrong in the local power park or backyard—a more motherly Dragon, but still strung with incessantly intrusive and costly lines of wire and ugly high-voltage towers.

It is hard for me to envision the Dragon dying in the next decade or two. It has powerful

allies. Foremost are the Accountants and the Traders. They wish to keep the cash-flow web fragmented into little sections that can make profits without having to consider the Dragon’s overall behavior. They lobby to isolate the costs of greenhouse gas emissions from the budget to avoid carbon taxes. They pretend that the consumer is not paying for the consequences through taxes for public health and disaster insurance. They try to keep “stranded costs” such as the costs of decommissioned nukes off their account

Three web configurations. In the “Y” arrangement (left), the electric current dead-ends and wastes itself as heat. In loop arrangements, heat is wasted when currents cross each other, but they are also more efficient in distributing current. Smaller grids waste less.



NUCLEAR

Prices are nearly double those of coal-fired units. Radioactive waste and decommissioning old plants add more financial burdens. Consumes 20 percent more water per kWh than fossil-fuel plants. Cost overruns and closures have left consumers with “stranded costs” for which they received little benefit. Not efficient to meet power surges. Small modular reactors and reduced greenhouse emissions have made for a mini-revival.

POWER LINES

Power lines now waste from 5 to 50 percent of all electricity passing through them. If they become more efficient—with high-temperature superconductors like new ceramics—they could help or hurt an emerging hydrogen economy (help if high temp transmission lines ran inside pipes of cooled liquid hydrogen; hurt if air-cooled wires out-compete the cost of new hydrogen pipes). Detroit is trying out new ceramic lines.

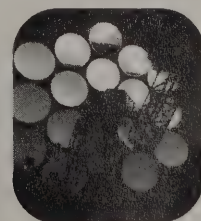


MICROTURBINES

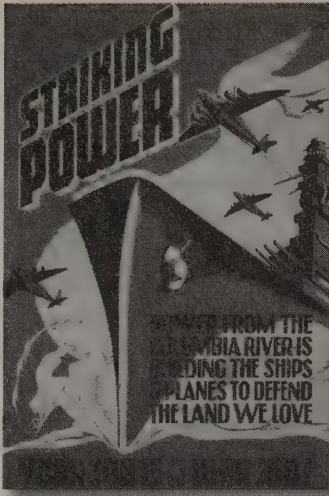
Sometimes called a turbogenerator, derived from military jet engine designs, with only one moving part and adjustable speeds. From 30 to 200 kilowatts, with 85-percent cogeneration efficiency. At 100 kW or less, better than reciprocating engines.

STIRLING ENGINES

Closed cycling power generators that are heated from the outside. Produce from 0.3 to 25 kilowatts at 15- to 30-percent efficiencies. Incredibly low repair rates and longevity are their selling points. Photo below shows solar collectors concentrating heat into a Stirling engine.



WPA poster. Wars always stimulate centralized power promotion. A new difficulty for micropower and the distribute-electric web.



books, so that shareholders will not see their stock price descend. They want consumers to cover even those sunken costs caused not by regulatory imposition, but by the utilities' poor financial planning.

At the moment, the Traders love the Dragon's sprawl. They simply buy and sell electrons. They never own a power plant nor a transmission/distribution net. Each time the current flows through a new juris-

diction customers pay a toll and Traders add a profit margin. Electric Dragon Traders thrive on perverse efficiencies, in which local grids make less profit than sprawling grids. Dragon slayers have years of work to remove the tollbooths and eliminate long-distance profiteering.

The dragon's other allies are Merger-Makers. Merging ownership of power plants creates political and electrical-supply clout. Merger-Makers lobby for all kinds of special privileges, such as federal eminent domain power to force private property owners to sell their land for new power plant sites or transmission line rights-of-way. They have learned neat tricks like taking power plants off-line for "repairs" to decrease supply. Off-line repairs enable them to skyrocket prices when needy utilities compete for an artificially limited supply. (But inside all these mergers are smaller departments working on micropower, waiting like good predators for the Electric Dragon's habitat to

Hi Tech Loves Six Nines

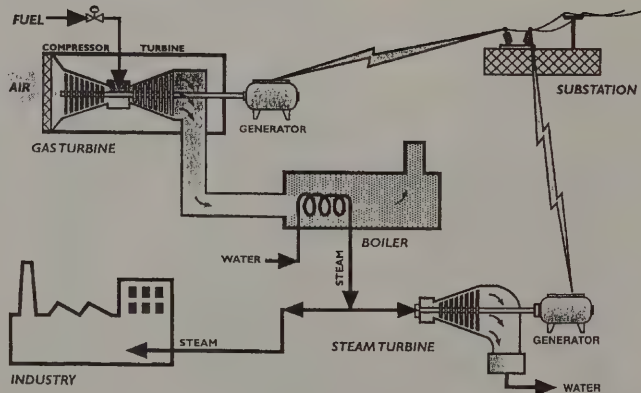
Hospitals and computer chip, semiconductor, pharmaceutical, chemical, biotech, and service businesses are supersensitive to blackouts, brownouts, and whimsical electron fluxes. Airlines lose about \$90,000 per hour for downtime; credit card companies about \$2.6 million; and brokerage firms about \$6.5 million. First National Bank of Omaha estimated that a one-hour outage can cost it \$6 million, and has now invested in Sure Power's four phosphoric acid fuel cells backed up by two flywheels and two diesel generators. They can supply 800 kW and run at six 9s (99.9999 availability). The system also reduces carbon emissions by 45 percent and other air pollutants by 95 percent relative to electricity produced by the grid. On-site micropower for security and business has helped subvert the Big Power Plant and Big Grid models.

RECIPROCATING ENGINES

Can produce from 5 to 10,000 kilowatts with a 20 to 45 percent electrical efficiency (the highest of all combustion-based micropower). They dominate the 5-mW and below off-grid generator market. Common as industrial and commercial back-up systems, their increasing use in Asia is particularly rapid. With reuse of waste heat, up to 80 percent efficiencies are possible. They run on diesel or natural gas. Noise and service costs are of major concern.

COGENERATION

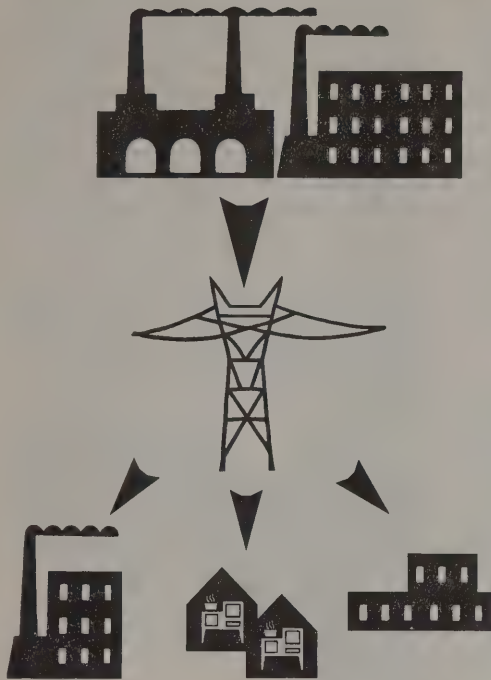
In cogeneration, the exhaust steam or heat for producing electricity or manufacturing is used again to drive the machines for another factory or for more electricity production. This "cascading" use of heat from the same fuel "cogenerates" electric power for oil refining, baking, brewing, paper-making, sewage treatment or even heating a hospi-



tal. In some cogen plants, 75 percent of the original energy in the fuel can be captured. Cogen started the "smaller is cheaper" revolution. Smaller cogen plants produce more sellable energy with less capital investment. The diagram above is from the Sacramento Municipal Utilities District cogen plant, in which heat from a turbine heats a boiler

which, in turn, creates steam for an industrial user. The Mitte Cogeneration plant is so successful that it can meet all the electricity, heating, and air-conditioning needs of central Berlin. Best access info is from the International Cogeneration Alliance (ICA), Rue Gulledele 98, 1200 Brussels, Belgium. +32 2 772 2611; ica@localpower.org.

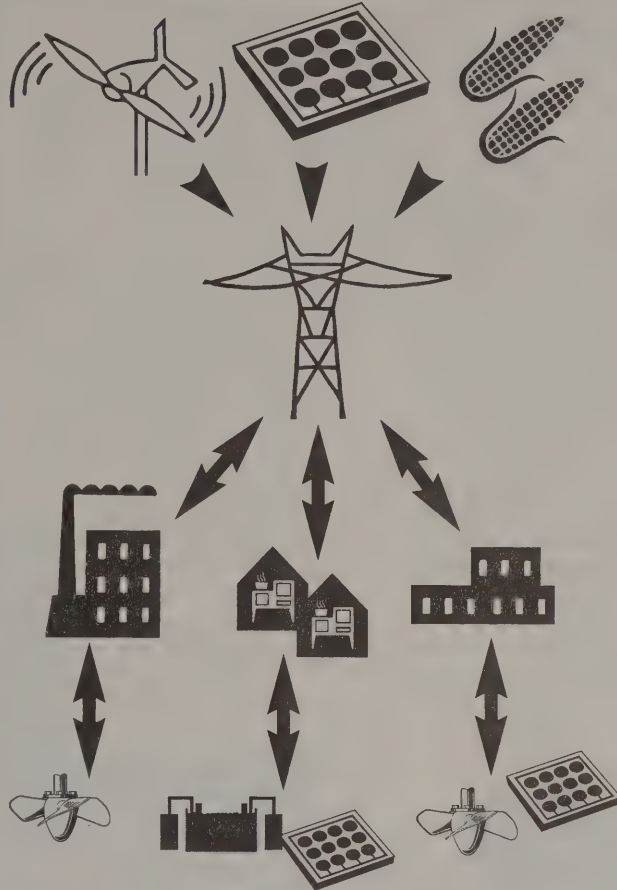
CENTRALIZED POWER SYSTEM



The CENTRALIZED POWER SYSTEM is one-way. At the top, a central power plant feeds high-voltage transmission to lower-voltage distribution lines to industrial, residential, and commercial uses.

The DISTRIBUTED POWER SYSTEM (right) can be two-way. At the top, diverse micropowers (solar photovoltaics, wind, microturbines running on natural gas, and biofuels) feed a medium-sized transmission line. At the bottom, commercial buildings receive from the grid, generate their own power, and also feed electricity back to the grid. Decentralized fuel cells, microturbines; PVs, and reciprocating engines are custom-designed for commercial, residential, and industrial users.

DISTRIBUTED POWER SYSTEM



Distributed Power governance can be more regional and local, designing mixes of power sources, changing rates to encourage negawatts, and arranging specific private/public contracts to reduce risk.

shift in a major way.)


Odd friendships have been made because of Accountants, Traders, and Merger-Makers. Green energy proles have joined with the insurance lobbyists and free-market psalmists to “level the playing field,” fashioning a habitat more friendly for micropower and life-cycle responsibility. In Washington, these aggregations are called “nightmare coalitions,” because, to many, becoming friends with your alleged enemies is a nightmare.

The Electronic Paradise

New technical wizardry will be infiltrating and taking over the creation, efficiency, and distribution of

electricity. Roofs may turn to shining solar plates (page 28). Hills may softly hum with pyramidal wind mills (page 26). The backyards and high tech buildings may house refrigerator-sized fuel cells (page 44). Living rooms will intelligently turn off their own lights when you walk out. And after the new baby Dragons have settled in, the energy structures—the towers with their aluminum and copper strands that crisscross the industrialized world—will stop spreading and may, in places, unravel. We can hope that the 1.8 billion worldwide without the grid will leapfrog over the Dragon and start with dispersed power sources. Regional fuels like

steam from the deep Earth or excess corn shucks (page 23) will enter custom-designed micropower plants for local feeds to the microgrid.

The Electric Dragon, once the Lord dolling out electrons to cool beer and heat hair curlers, will now also buy electrons from its subjects with their new decentralized toys. Meters will run backwards. Off-the-grid power stations will liberate the landscape, and make it easier for landscape photographers to find romantic snapshots. Listen to the diviners who announce: micropower will change the world. Power to the people, just as the shift from mainframe to laptop democratized info. 

Reinventing Electric Utilities

Reinventing does what Donella Meadows (page 58) advocates: celebrates complexity, expands the boundaries of caring, listens to the wisdom of the system, stays a learner, and locates responsibility.

Regionalism thrives in the transmission lines. Intimate and informed—told through the story of the Sacramento Municipal Utilities District, the third largest US utility—Reinventing is absolutely hypeless. Here are the political hard knocks and the unexpected wild cards frustrating change in our sources of energy and energy infrastructure, and corroding fair deals for consumers. An optimistic take on how to deal, for instance, with how “stranded costs” of failed and over-budget nukes have prevented megawatts and cheaper fuels from lowering consumer bills. I especially like how Smeloff and Asmus compare Californian, New Englander, Minnesotan and Texan attitudes on energy/cash comingling. —PW

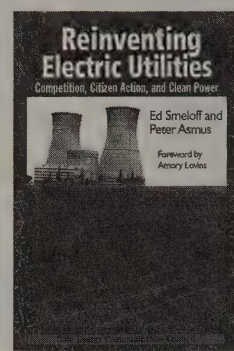
“ Rancho Seco...was originally scheduled to go into operation in October of 1974. Several

thousand people had gathered at the site to dedicate Sacramento's new source of electricity. President Gerald Ford had sent a telegram congratulating SMUD for helping to reduce the nation's imported oil by one million barrels of oil a day. What the crowd didn't know was that the plant's steam turbine had malfunctioned, forcing a shutdown before the ceremony began. Although the concealed problem didn't dampen the festivities on its dedication day, it turned out to be an omen of things to come.

“ Rather than build transmission lines and distribution facilities to move electricity from central power plants to the consumer, some utilities like SMUD are looking at ways of producing power closer to the customer through many small power plants. With plants scattered throughout the utility system, and even located on customer premises, this arrangement can save money and minimize the need for rights of way through public and private property. It would also signal a return to a more decentralized electricity system similar to the one existing at the turn of the century.

“ The [California Energy Commission] identified three steps that could be taken to maintain

or increase the benefits created by utility [demand side management] programs. The first step is to separate the generation and distribution portions of utilities to eliminate financial conflicts of interest between the sale of energy as a commodity and energy efficiency as a service. The second is to use [performance-based ratemaking] mechanisms that link revenue recovery to the number of customers served by the distribution utility rather than to the number of kilowatt hours sold. The third is to create a nonprofit organization to oversee the use of rate-payer-funded expenditures on energy efficiency measures.



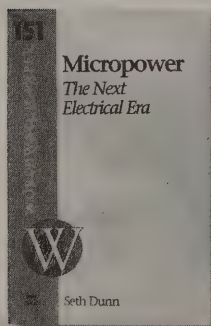
Reinventing Electric Utilities Competition, Citizen Action, and Clean Power

Ed Smeloff and Peter Asmus
1997; 239 pp.
\$17.95
Island Press

Micropower

Micropower (power generators that are less than 10 megawatts, such as wind turbines, fuel cells, and solar panels) do not need to connect to high-voltage transmission systems. The micropowers can connect to low-voltage distribution systems; and when not needed at home or industry, can run the meter backwards. Read all about it in this, the best overview, with great web and hard-copy access. Coming sooner than you think to postmodern neighborhoods, industrial and rural: micropower and microgrids that will once again change the world. —PW

“ ...micropower units can be built in factories, transported to their site, and installed in a matter of hours. By contrast, large power plants must be built on site, and construction can take months, years, or even decades.



Micropower (Worldwatch Paper #151)

The Next Electrical Era

Seth Dunn

2000; 94 pp.

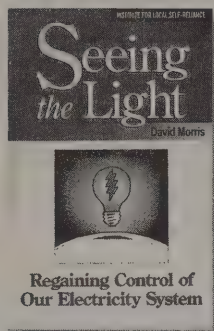
\$5 downloadable or by mail (\$9 postpaid), PO Box 879, Oxon Hill, MD 20797. 800/555-2028, www.worldwatch.org

Eight Benefits of Micropower

Benefit	Description
Modularity	By adding or removing units, micrower system size can be adjusted to match demand.
Short lead time	Small-scale power can be planned, sited, and built more quickly than larger systems, reducing the risks of overshooting demand, longer construction periods, and technological obsolescence.
Fuel diversity and reduced price volatility	Micropower's more diverse, renewables-based mix of energy sources lessens exposure to fossil fuel price fluctuations.
“Load-growth insurance” and load matching	Some types of small-scale power, such as cogeneration and end-use efficiency, expand with growing loads; the flow of other resources, like solar and wind, can correlate closely with electricity demand.
Reliability and resilience	Small plants are unlikely to all fail simultaneously; they have shorter outages, are easier to repair, and are more geographically dispersed.
Avoided plant and grid construction and losses	Small-scale power can displace construction of new plants, reduce grid losses, and delay or avoid adding new grid capacity or connections.
Local and community choice and control	Micropower provides local choice and control and the option of relying on local fuels and spurring community economic development.
Avoided emissions and other environmental impacts	Small-scale power generally emits lower amounts of particulates, sulfur dioxide and nitrogen oxides, heavy metals and carbon dioxide, and has a lower cumulative environmental impact on land and water supply and quality.

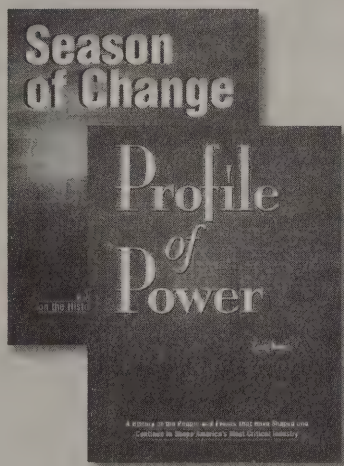
POWER TO THE PEOPLE

One-third of us own electric companies, directly as voters in 900 cooperatives or indirectly as voters in 2,100 municipalities. Two-thirds of us can't really vote. We are customers of 240 investor-owned utilities. Only the shareholders vote, creating tension between customers and owners. The federal power authorities are run by directors appointed by the president and confirmed by the Senate. They are even harder to influence, but they are small generators except for the Tennessee Valley Authority and the Booneville Power Authority in the Pacific Northwest. In general, energy has played private v. public, profit v. service, futures thinking v. utility/public power conservatism. How much democracy should go into energy policy? (In choosing sources of power? efficiency budgets? security for elders and the poor?) —PW



SEEING THE LIGHT
Regaining Control of Our Electrical System
David Morris
2001; 160 pp.
\$15. Institute for Local Self-Reliance

The best high-voltage manual for charged-up activists who want to reconfigure their community's place in the electric web and nurture green micropower. Easy to read in a field awash in acronyms and twisted concepts. Rules for assuming authority; acting responsibly, and decentralizing capacity.



PROFILE OF POWER
A History of the People and Events That Have Shaped and Continue to Shape America's Most Critical Industry
Scott Ridley
1996; 66 pp. \$20. APPA (below)

SEASON OF CHANGE
A Profile of Power Update on the History of the Electric Utility Industry 1996-1998
Scott Ridley
1999; 32 pp. \$10

American Public Power Association (APPA), 2301 M Street NW, Washington, DC 20037-1484. 202/467-2910, www.appanet.org

Meet Mr. Utilities. Scott Ridley has the 120-year-long view. Meet Thomas Edison and early municipal power systems, the rise of monopolies, rate wars, the externalities like stock market crashes and wars, and the emergence of the feds in energy affairs. It's all electrons zooming through networks constructed by regulatory changes, mergers, and public/private delivery systems.

AMERICAN LOCAL POWER PROJECT
www.local.org

The network for local communities dealing with electric utilities dereg. Great links to the news, public interest groups, public and cooperative power.

CALIFORNIA ALLIANCE FOR DISTRIBUTED ENERGY RESOURCES (CADER)
916/654-4880.
jpgopal@energy.state.ca.us

A voluntary nonprofit committed to facilitating the deployment of efficient and environmentally responsible distributed energy resources into competitive energy markets.

"GREEN ENERGY" MARKETING: GREEN BUYERS BEWARE
Nancy Rader
1998; 52 pp.
\$23.50 noncorporate
Public Citizen Critical Mass Energy Project
1600 20th Street NW, Washington DC 20009.
800/289-3787,
www.citizen.org/cmep

When Green Mountain left California, green energy took a PR

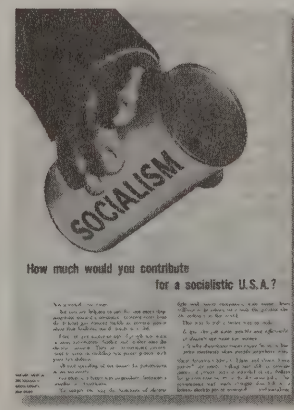
nosedive and embittered idealistic consumers. This is key lime pie in the face of green marketers and mainstream enviros. Often green power is the emperor's clothes and customers are already paying for existing green power. The book urges greenies like EDF and NRDC and big boys like Enron and Edison to tone down free market nonsense; require companies to tell if their green energy is new, planned, or in place; and require "greenies" to have a broader climate change policy.

POWER LOSS
The Origins of Deregulation and Restructuring in the American Utilities System
Richard Hirsh
2000; 406 pp.
\$50. MIT

Best academic history.

NATIONAL RENEWABLE ENERGY LAB
617 Cole Blvd, Golden CO 80401-3393, www.nrel.gov/data

Basic optimistic resources on all renewables except tidal. Corporate style. Very extensive photo library.



FROM PROFILE OF POWER

EMPOWERED WORDS IN THE NEW ELECTRIC WEB

Renewable Portfolio Standards (RPS) require all power generators (or retail suppliers) of electricity to supply a certain percentage of renewable energy. RPS are market-based but fair (all competitors are treated equally within the state). Adopted by six states. (see American Wind Energy Association, page 27.)

The Public Aggregator Laws (Community Choice) are now in Massachusetts and Ohio. They allow local groups to enter into competitive bidding for their

members/citizens/consumers; administer energy efficiency programs; require Renewable Portfolio Standards; and allow a community authority to define energy goals of service area. Through a public referendum, citizens vote to become a "public aggregator" whose representatives will purchase electricity for all consumers in the service area. Public aggregators do not own poles and wires and may not do metering and billing. They are essentially "brokers." (See Cape and Islands Self-Reliance Corporation, www.reliance.org,

the great innovators and advocates of community choice.)

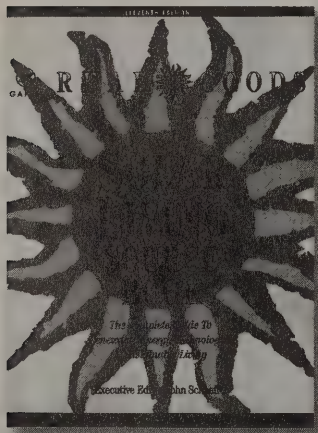
Stranded Costs: Under restructuring agreements, utility companies must sell or settle their lost investments on power plants or lost investments from contracts to purchase electricity. These are stranded costs. A typical stranded cost is for decommissioning nuclear power plants. Who pays the stranded cost (shareholders, consumers, holding companies, utility operating profits) is highly contentious.

Solar Living Source Book

Whole Earth has reviewed all eleven editions of the Solar Living Source Book. J. Baldwin in 1994: "The new edition augments the Real Goods tradition of providing a basic energy education along with product descriptions. It could well serve as the text for an entry-level course in applied energy efficiency." We've watched Real Goods learn from experience, extend its reach, deepen its understanding of the planet and its processes, offer better products with more wisdom. This edition is simply the best. From choosing batteries to refrigerators, off-the-grid futurism to emergency preparedness, water pumps to photovoltaics, there is no better and more enjoyable the-future-is-here-and-now page-turner.

The Source Book directs its readers toward cyberspace: "You just can't beat a virtual catalog for environmental responsibility. In fact, our website uses only post-consumer electrons....It's quite possible that virtual catalogs like ours will reduce (or even eliminate) the more wasteful aspects of the mail order business in the not-too-distant future." —PW

The eleventh edition remains a paragon of a catalog that explains enough of the principles involved to enable intelligent choices. Moreover, they seem to have dumped dumping on Christians and Republicans—at least half of the market—for kicks. About time. —J. Baldwin



Solar Living Source Book The Complete Guide to Renewable Energy Technologies & Sustainable Living

John Schaeffer, executive ed.

2001 (11th revised ed.); 590 pp.

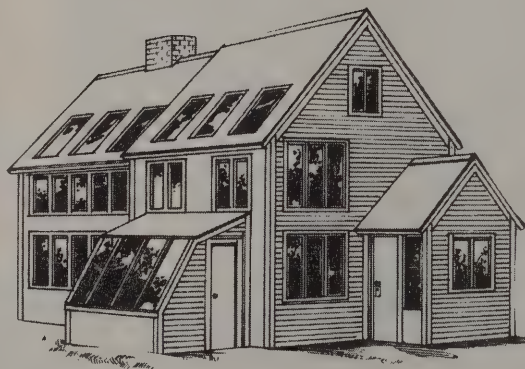
\$30 (\$37.25 postpaid from Real Goods Renewables, 360 Interlocken Blvd., #300, Broomfield, CO 80021. 800/919-2400, www.realgoods.com.)

Free with Real Goods lifetime membership (\$50), which also includes a 5-percent discount on all purchases.



"Whiter, Brighter Full-Spectrum Task Lamp

This full-spectrum halogen lamp provides heightened contrast (eases eyestrain), and superior color rendering. The bulb used in this lamp was chosen by the National Gallery of Art for "Van Gogh's Van Goghs." The bulbs were specifically chosen for their excellent color-rendering capability and low ultraviolet production (no fading!). Heavy weighted base (8.5" Dia.) with a four-joint pivoting neck (36" fully extended) for maximum directionality. 50-watt halogen bulb with a 3,000-hour bulb life. 9' cord. Taiwan. **341-719 Full-Spectrum Halogen Task Lamp. \$169.00.**



"Solar Principle #6: Do not overglaze

Incorporate enough windows to provide plenty of daylight and to permit access to cooling breezes for cross-ventilation, but do not make the common mistake of assuming that solar design requires extraordinary allocations of wall space to glass. An overglazed building will overheat....Locate your windows primarily on the home's south side, with fewer windows on the east- and west-facing sides and only enough windows on the dark north side to let in daylight and fresh air.



"A Heat-Powered Woodstove Fan

The Ecofan was voted Real Goods Product of the Decade, as it was our best-selling item by far for the last four years!

The Ecofan uses heat from your woodstove to run a heat-distributing fan. The thermoelectric generator starts the fan automatically and adjusts speed according to stove temperature. The hotter your stove gets, the faster it runs....Because it uses only the heat from the stove, the Ecofan costs nothing to run. It doesn't plug in, there are no batteries, and it can be used where there is no electricity....Laboratory tests have shown a 30% faster increase in temperature on a wall 30 feet from the woodstove using the Ecofan. **64-207 Ecofan Woodstove Fan. \$109.00.**

"To get the most out of your investment, site your wind turbine to best advantage: well away from buildings, trees, and other wind obstructions. Install the turbine on as tall a tower as you're comfortable working with....The classic rule from the 1930s dictates that for best performance, your wind turbine should be at least 30 feet above any obstruction within 200 feet of the tower. Under the best of conditions, a tower height of 30 feet is the absolute minimum....

Putting a turbine on the roof is no alternative. Seldom can you get the turbine high enough to clear the turbulence caused by the building itself.

INCREASE IN POWER WITH HEIGHT ABOVE 30FT (10M)

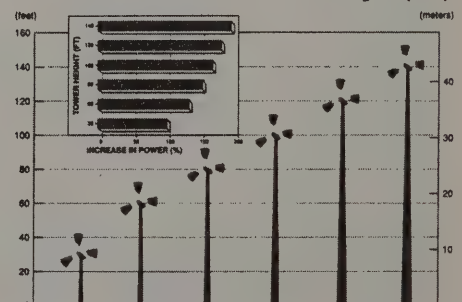


CHART ADAPTED FROM WIND POWER FOR HOME AND BUSINESS

Energy Plant Species

Sun to plants; plants to humanized electricity and heat. This is the most thorough and intelligent advocacy encyclopedia for biofuels. From adzuki bean to willow, from gasification to pyrolysis. Energy Plant Species lays out a new vision of a multifaceted energy farm—erosion control, wildlife enhancement, soil enhancement, rural job creation, biofuel harvesting, and conversion technologies. Over eighty species are profiled.

We tend to think of energy from plants as Ethiopians stripping the forest for fuelwood. That image is not untrue, as 33 percent of all energy for heating and cooking in the less-industrialized nations comes from trees, shrubs, and dung. In these nations, lungs in huts suffer from biofuel pollution as much as, if not more than, in any industrial city. Ethiopia has the sad local experience of an arid, overpopulated land with no irrigation and few alternative choices.

But from the planetary view, plants are filled with safe energy: sugars for ethanol, oils (Rudolf Diesel used peanut oil to power one of



Women carrying firewood in Ethiopia.

his engines), crop residues, perennials harvested annually by short rotation coppicing, silage, or biogas from fermenting fresh green plants.

Like all fuel sources, there are issues. Here are a few: high prices when irrigation or fertilizers are required; competition for land between fuel cropping and food cropping; the costs of "off-set" planting for fossil fuel mitigation v. the costs of replanting biofuel crops; biofuel monocropping (do we want more eucalyptus?). But that's why this book is so good. By the end, you are inside the argument, not alienated from botanical power plants. —PW

“Measurements were carried out on buses and private vehicles to compare CO, CO₂, SO_x and NO_x emissions with respect to mineral diesel, biodiesel and a 30% diesel blend. CO₂ and SO_x emissions were eight times higher when mineral diesel was used. The emission of NO_x was 10% higher from biodiesel (RME)... The use of rape seed oil and RME in diesel engines instead of diesel fuel reduces the emission of carcinogens and polycyclic aromatic hydrocarbons (PAH) in the exhaust gas.

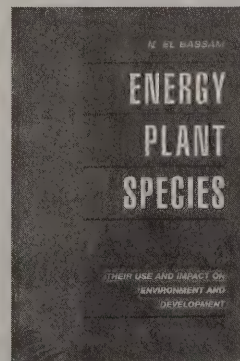
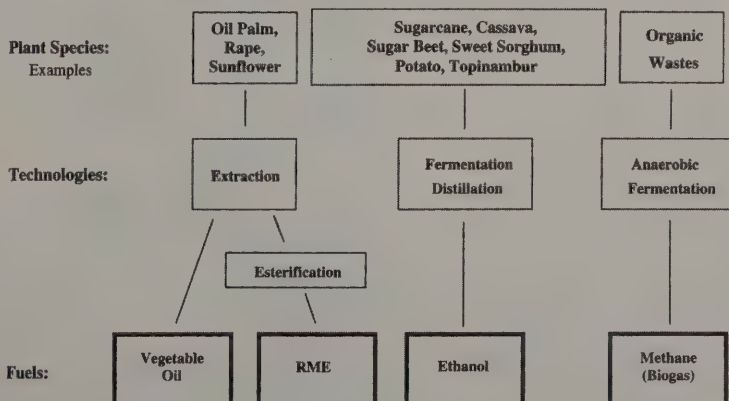
“ Crop production strategies need to be developed that are as efficient as possible in capturing sunlight (solar energy) and storing it in plants (the solar battery). Desirable characteristics for energy feedstocks include:

- efficient conversion of sunlight in plant material (biofuel);
- efficient water use, because moisture is one of the primary factors limiting biomass production in most parts of the world;
- sunlight interception for as much of the growing season as possible;
- minimal external inputs to the production and harvest cycle (seed, fertilizer, machine operations and crop drying)—i.e., low input plant species;
- a sustainable energy balance—i.e., a positive energy balance;
- high dry matter contents at time of harvest;
- high energy density (expressed in MJ/kg etc.)—i.e., rich in oils, sugars, starches, lignocellulose, etc.;
- their production and use have the lowest possible environmental impacts.



Biodiesel fuel station.

Conversion Technologies



Energy Plant Species Their Use and Impact on Environment and Development

N. El Bassam
1998; 321 pp.

\$75

James & James
www.jxj.com

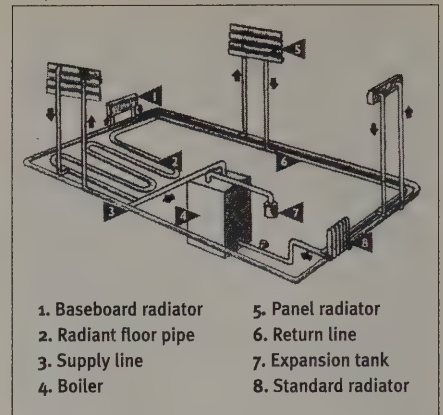
Conversion possibilities for biomass rich in oils, sugars, and starch.

No-Regrets Remodeling

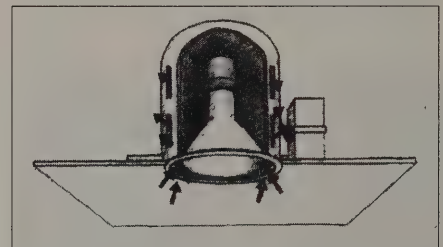
Anyone with the opportunity to work on their house should read *No-Regrets*. It's the primer on how your home loses and uses energy. It's written for those who don't have much experience in home repair/construction, and filled with reminders for those who do. It's a wake-up: there's lots you can do to eliminate drafts, end mold and mildew, stop family thermostat wars, provide quiet, save on utility bills, and enhance lighting and heat management. From here, you decide which concerns are yours and seek out details from savvy builders and contractors or other manuals and books.

As a builder, I have a few reservations. *No-Regrets* presents photovoltaic roof shingles uncritically. The PV shingles sport too many shingle-to-shingle connections; there are too many chances for any single connection to fail, and they're difficult to repair. PV seam plates are a better bet. Also, some of the book resources seem out of date. But put *No-Regrets* on the shelf. It's the best available overview, in one book, for saving household energy by remodeling. —Roger Kent

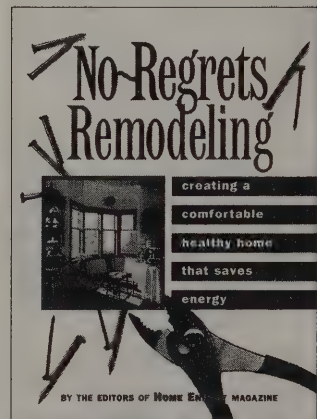
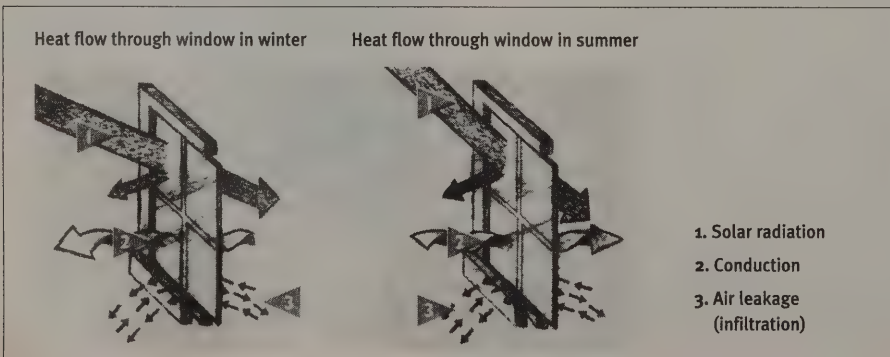
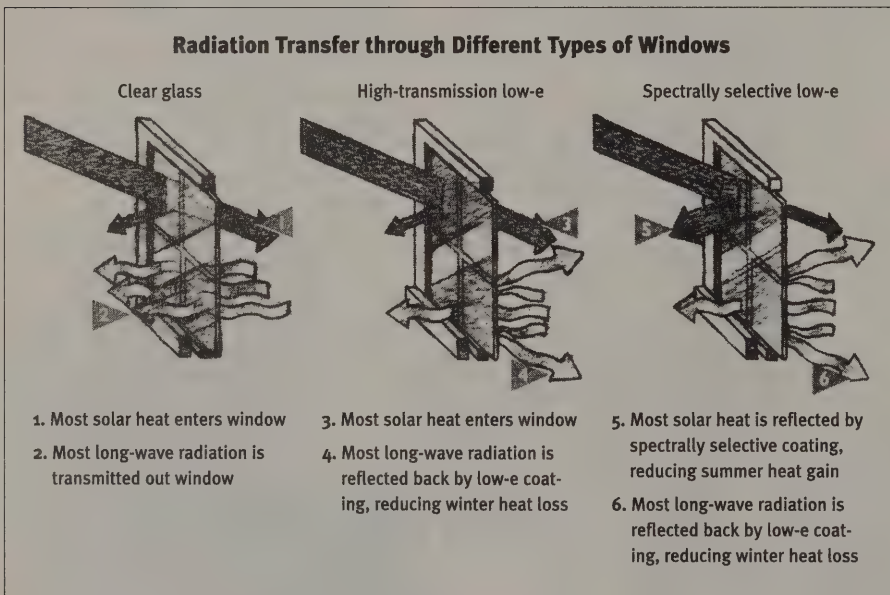
“ You might think you are simply remodeling your kitchen or bathroom. Guess again. That remodel can easily have repercussions in distant parts of the house that were never touched during construction. Some common post-remodel problems are moisture in new places, indoor air that causes headaches and allergic reactions, and hot or cold spots in the house. These changes occur because the house is made up of many complex and interconnected systems. Some are obvious, like the water heater and its pipes, or the collection of lights scattered around the house. The heat delivery system is easy to pinpoint, but the heat loss system is not. Heat travels through dozens of cracks and holes, under floors, inside walls, up passageways made for plumbing, and through leaky windows and doors. It's useful to think of the whole house as a single interlinked system so you will understand why, for example, installing a new water heater in the basement may cause smoke from your fireplace to come into the room instead of going up the chimney. In this way you can plan changes that bring real improvements rather than regrets.



Instead of circulating warm air throughout a home, a hydronic system pumps hot water or steam from a boiler through pipes and radiators or copper-finned baseboard radiators, and then returns it to be reheated and recirculated. With a hydronic system, you can regulate the temperature in each room. You can also use the same boiler for domestic hot water. Hydronic systems cost more to install than forced-air systems. They can be slow to warm up, and, unlike forced-air systems, the same distribution system can't be used for central air-conditioning.



Recessed downlights are very popular in kitchens, but they can cause hidden problems. Typical recessed fixtures create large holes in the ceiling. This allows a lot of air to pass from the room into the space above the ceiling, where trouble could be brewing.



No-Regrets Remodeling
 Eds. of *Home Energy* magazine
 1997; 222 pp.
 \$19.95 (\$23.90 postpaid) from Book Orders,
Home Energy, 2124 Kittredge Street, #95, Berkeley,
 CA, 94704. 510/524-5405, www.homeenergy.org

Building with Vision

Q: But isn't wood a natural, renewable resource? Why seek alternatives? My dream house will be all natural wood.

A: Unfortunately, wood is only renewable if each tree cut down is replaced, preferably in a diverse ecosystem rather than a tree farm. This is not usually the case. Population pressures, poverty, and clear-cutting are rapidly deforesting the Earth while causing much associated damage.

Q: So what do we build with, then? I like wood.

A: Find out in this book. Sponsored by Forest Trends and the Rainforest Action Network, it's a useful introduction to the many available materials and techniques that do not require cutting down trees. Most all the choices are here: straw bales, cob, Pisé, recycled wood and wood waste, foam, steel, EcoCrete, and many more are described and compared, complete with advantages, disadvantages, economics, codes, longevity, ecological footprints, and sweat index. No construction details (it's only an introduction), but good lists of sources and resources. My only quibble is that the authors assume traditional friction-and-gravity architecture rather than celebrating the unique potential of designs (e.g., molded, sculptured, or domed) more appropriate for our time. —J. Baldwin



Light straw walls, which combine straw for insulating and tensile properties with clay for mass, have survived for hundreds of years in Europe. From *Building with Vision*.

“ Because there is so much standing stock of recyclable steel in the world today (cars, ships, I-beams in buildings and superstructures, etc.), a recent lifecycle assessment conducted by Scientific Certifications Systems (SCS) in Oakland, California, and released in November 2000 by the Steel Recycling Institute argues that it should be viewed as a sustainable resource.

“ It is estimated that an acre of forest—up to 44 trees—goes into the 12,500 board feet that make up the average 2,000-square-foot home in the United States....In addition to wood products, the extraction of minerals and fuels needed for metals, glass, plastics, concrete, and other products required to build the average house gouges out a crater equal to the size of the house itself, according to geologist John Wolfe...40 percent of the material resource and energy flows in the global economy are attributed to constructing or maintaining buildings. The global transportation of building materials and other related resources carries other impacts. Invasive diseases and organisms are regularly relocated via ship ballasts, raw logs, and other cargo, contributing to an escalating extinction crisis.



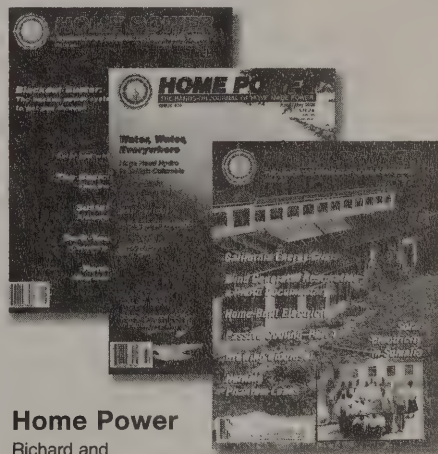
Building with Vision Optimizing and Finding Alternatives to Wood

Dan Imhoff
2001; 136 pp.
\$22 (\$24.75 postpaid; plus 7% tax in CA)
Watershed Media, 556 Matheson Street,
Healdsburg, CA 95448.
www.watershedmedia.org

Home Power

For more years than I can remember, Home Power magazine has been the best place to go for advice on what works and what doesn't in providing (and using) your own electricity. The articles and reviews are clear even to newcomers. Product reviews include users' experiences even when they discredit an item advertised in the magazine. I've used information from these folks many times, and never gone wrong. —JB (from Whole Earth, Winter 1999)

“ It's a common misconception that Stirling engines are some sort of high-tech invention, belonging more in NASA research labs than in the basements of home tinkerers. This perception perhaps comes from the many attempts to make Stirling engine-powered cars during the energy crisis of the '70s. Making a Stirling engine that matches the performance of a typical auto engine is indeed a daunting task. But lower performance Stirling engines can be simpler to build than even steam engines, which seem simple, but actually have a lot of hidden complexity....Basement tinkerers and [renewable energy] enthusiasts will find the Stirling engine a rich area for study, as well as potentially ideal means of utilizing renewable energy sources.

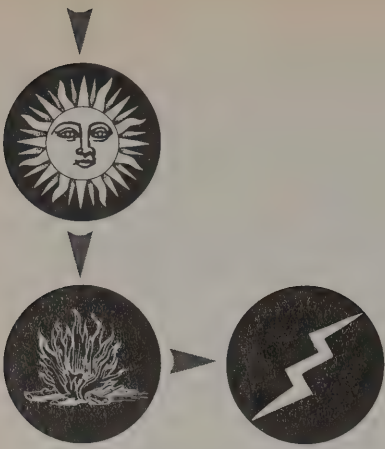


Home Power

Richard and
Karen Perez, eds.
\$22.50/year (six issues)
PO Box 520, Ashland, OR 97520.
800/707-6585, www.homepower.com

In areas where economic forces have made wood framing more expensive, light-gauge steel is emerging as an alternative. From *Building with Vision*.





Wind power

Windy Vallejo to Go Off Oil by David Bolling

Right: TMA's 750-kW wind turbine. The air foils guide and accelerate wind from any direction into multi-blade rotors, turning a power shaft that drives a generator inside the building's foundation. A single 750-kW generator could provide all the power needed for a small town of 500 or more homes for about \$1 million, plus distribution costs.

When the oil and gas boys wrote up a National Energy Policy last May, the results were utterly predictable. Oil, coal, and nuclear energy framed their recommendations, which reflected the belief that when your nation is burning up 25 percent of the world's annual oil supply, the solution to shortage is to find more stuff to burn.

The Bush priorities included drilling for oil in the Arctic National Wildlife Refuge and investing \$2 billion over the next ten years to fund further research on clean coal technology. By contrast, the Energy Policy team's proposal for research and development in renewable energy amounted to about \$39 million.

Meanwhile, the city council of Vallejo, California is about to embark on a wind energy odyssey that could take an entire town of 117,000 people off the high-voltage nuke/coal/oil transmission lines in five years.

Vallejo is a working-class city on the Carquinez Straits, where the Sacramento River drains into the San Pablo and San Francisco Bays. The straits funnel a torrent of wind upriver into the hot interior of the Central Valley, and could, wind researchers believe, provide the city with up to 500 megawatts of power annually. That's enough electricity for every home and business in town.

In August the Vallejo City Council approved a plan to negotiate with Terra Moya Aqua, Inc., (TMA) a Wyoming manufacturer of innovative

wind turbines. Terra Moya Aqua has developed a vertical-axis, variable-speed, omni-directional wind turbine that is fully enclosed, looks nothing like a windmill, is virtually silent, will operate in winds up to a hundred miles per hour and, company representatives claim, won't kill a single bird.

That last claim is important for any would-be wind farmer. Vallejo is on the edge of the Pacific Flyway and adjacent to Suisun Marsh, the largest remaining coastal wetland in the state and home to millions of migrating and resident birds. Ducks Unlimited and local environmental groups had already expressed opposition to any windmills in the area.

But TMA convinced Vallejo officials that during four years of Wyoming tests, in an area with abundant bird populations, there were no avian deaths or injuries. That's because the vertical turbine is housed inside a building-like structure that can be fully screened.

Vallejo's conversion to the gospel of renewable energy came at the hands of Larry Asera, an engineer, former county supervisor, and energy consultant with decades of experience in solar and wind power. Asera drew up a master energy plan to give Vallejo power independence through a combination of wind, solar, and small



hydroelectric sites. He negotiated a deal with BP Solar to construct a 1-megawatt photovoltaic facility to power City Hall. By some strange serendipity, TMA approached the city soon afterward to propose a wind project. It was a match made in renewable heaven, and if power purchase negotiations are successful, TMA will have a preliminary 10-megawatt site online sometime in 2002. Today, says Asera, "wind is the cheapest energy available. Period."

If Asera's plan and TMA's technology are successful, Vallejo will save \$1 million a year in energy costs and will become one of the biggest, if not the biggest, cities in the world running completely on renewable power. "It's a little embarrassing we haven't done it sooner," says Vallejo's public information officer, Mark Mazzafero, "but until now, the policy's been oil."

Reaping the Wind

Back in the seventies I knew an entrepreneurial hippie who lived among the redwoods in Sonoma County, California and sold wind turbines with the zeal of a Pentecostal preacher. By the mid-eighties he had disappeared from view. So, I thought, had California's tax shelter-induced fascination with wind power.

I was wrong. As Peter Asmus eloquently documents, wind power didn't disappear, it just quietly matured and is reemerging as a powerful, affordable, and environmentally friendly alternative to the evils of fossil fuels.

The pioneers of wind energy are an iconoclastic lot, tilting, if you will, at the windmills of conventional energy wisdom and quixotically persisting in the face of difference and opposition. Asmus profiles many of them while tracing the evolution of an industry that is beginning to experience explosive growth with technology that is finally both reliable and profitable.

There probably isn't a better book on the subject. —DB

“William Heronemus was a dangerous man suggesting an audacious departure from the status quo. Because of his nuclear navy credentials and impressive grasp of convincing facts and figures, his call for fleets of huge wind turbines on ships floating off America's shores in the early 1970s received considerable media attention. *Science* magazine called him “a prophet”...

“Tribes such as the Navajo and Hopi view the harnessing of solar and wind power as one of the few business opportunities that

LATEST SPIN

Wind energy capacity was up 30% in 1999. It now provides 10% more electricity than 1990. It is still less than 1% of world total of power generation.

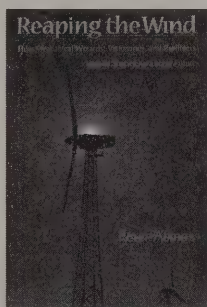
South and North Dakota and Texas lead US in capacity but can't find power lines to connect to. Texas wind farms (Danish turbines) spin out enough electricity for 139,000 homes and deny the sky 20 million tons of CO₂.

Wind now equals 7% of Denmark's electricity production. Half the wind turbines in the world are from Denmark. It hopes to generate 50% of its electricity by wind by 2030.

In Germany, wind power accounts for 2% of all electricity (between 10 and 15% in northern regions).

If near-shore wind generation becomes financially feasible, then Baltic and North Sea generation should meet the supply needs of Europe.

is reconcilable with their legacy of self-determination, sovereignty, and environmental values....Because Native American lands such as those owned by the Navajo and Hopi feature the best solar and wind energy sites in the country, among the most economical power sources for these Indians will be renewable energy systems.



Reaping the Wind How Mechanical Wizards, Visionaries, and Profiteers Helped Shape Our Energy Future

Peter Asmus
2001; 227 pp.
\$24.95
Island Press



How to Build Your Own Wind Meter

I made this wind meter from four two-liter soda bottles, a bicycle speedometer, and some scraps of wood. First cut the top cones off the bottles, leaving a plastic tab hanging down. Arrange the tops in a circle and screw each tab into the lid next to it. Fasten a wooden crosspiece and tie its ends to the necks of the bottles. Drill a hole in the center of the crosspiece and nail it to the top of a stick so it is free to rotate. Attach the magnet to the crosspiece and the bicycle computer to the stick. Hold the contraption in the wind and watch it spin! To calibrate, change the rim size on the speedometer. I calibrated by holding the meter out of a moving car and adjusting until its speedometer matched the car's. —Reuben Margolin

ANNUAL BIRD DEATHS, USA

Cats: 100 million (Audubon estimate)
Vehicles: 60 to 80 million
Buildings and windows: 98 to 980 million
Power lines: tens of thousands to 174 million
Communication towers: 4 to 50 million
Wind generation facilities: 10 to 40,000

SOURCE: "AVIAN COLLISIONS WITH WIND TURBINES," NATIONAL WIND COORDINATING COMMITTEE (SEE ACCESS)

WIND ENERGY RESOURCES

SOLAR LIVING SOURCEBOOK

(see page 104)

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www.windpower.dk and
www.symbiosis.dk



Solar Shareholding

Goes Primetime

by Keith Rutledge

Cash-Flow Accounting for Home PVs

What can Americans do to help in the current world crises? Take responsibility for our energy supply and invest in the future of the world through developing solar applications.

As we know, solar power generation creates virtually no pollution or environmental damage, while global climate change produced by fossil-fuel generation sources continues to increase, threatening the planet.

Solar electricity is indeed ready for prime time, and now is the time. People are ready for solar *if they can afford to switch*. Here's the news: Through a combination of improved technology and government incentives, home PV (photovoltaic) systems are not only affordable, but can cost less over time than electricity purchased off the grid.

The key to affordability is to spread the costs over many years and to receive financial assistance to maintain a low monthly bill. In order to provide an affordable "unit price" (cost per kilowatt-hour—\$/kWh), the costs of all electricity systems have historically been financed over long periods of time as well as subsidized by significant financial incentives and taxpayer support. Many of those

opportunities now exist for solar.

Prices for electricity vary across the nation, from \$.04/kWh to \$.24/kWh and higher. They rose to as much as \$1.90/kWh during last summer's California "energy crisis."

Can a Photovoltaic (PV) module be competitive? A PV produces direct current (DC), which may be used directly for applications such as water pumping, cooling fans, water heating, aeration, and desalination. DC electricity can be stored in batteries for use later in lighting, electronic devices, and even cooking. For a PV system to supply alternating current (AC) such as that provided by electric utilities, a solid-state electronic device called an inverter is needed to "invert" the DC into AC. It is very efficient and reliable. Inverter replacement and batteries add to costs (see below).

To compare steam-powered/grid-networked electricity with PVs, consider how much electricity is going to cost an average homeowner over the next thirty years.¹ A home consuming 500 kilowatt-hours (kWh) per month at an average cost of \$.15/kWh will cost \$27,000 over thirty years (more likely, costs will rise over thirty years; an average annual 3 percent rise in prices would raise this cost to \$43,000, and a 5 percent rise to almost \$60,000). "Renting" electrons from centralized power plants and grid managers means spending money that could have been invested in buying a solar energy system.

For example, the sun that shines on a 100-square-foot space has the ability

to generate one kW of electricity. A 3-kW PV system in the sunbelt could provide a home an average of 500 kWh per month in the space of a 15 feet by 20 feet south-facing garage roof. In northern latitudes the system would need to be increased to 4 or 5 kW, if the home employs electric heating. Recent installed costs for PV systems tied to the electric grid (without batteries) range from \$7 to \$12 per watt, for a cost of \$21,000 to \$36,000 for a 3-kW system. Comparing the calculations above, this is less than or at least comparable to the thirty-year costs of purchased electricity, even without further incentives or selling electrons back to the grid.

Net Metering—Exporting Electricity

Over the past thirty years PV technology has been used in applications where there are no utilities. However, recent changes in the laws regulating the electric utility industry allow a PV system to be interconnected to the electric utility grid to take power from the grid *and* to generate power into the grid—effectively running your meter backwards! This net metering process is now offered in more than half of the states and will eventually be a part of national electric utility deregulation affecting all states.

Using the utility grid as a storage device avoids the cost of storing any excess generation from a home PV system in costly batteries. Net metering also credits the energy generated at full retail value (and in some cases even higher than retail where "time of use" net metering is included). Over time, as electricity prices rise so does the value of the electricity you are generating.

1. This article assumes a simple scenario of a cash purchase with no costs for repairs and possible replacement. In reality there will be some of all of these. The purpose of these examples is not to calculate precise costs, but to present the basic economic reasoning involved with solar electric generation. Long-term warranties are typically included in solar energy system purchase prices, and extended warranties or service agreements may also be purchased. Insurance should be added to cover the replacement value of the system. The inverter is a possible repair item and if batteries are included there will be a replacement cost at some point depending upon battery type.

Most net metering laws do not require the utility to purchase any excess generation over 100 percent of the annual (or in some cases monthly) consumption of the homeowner. But some net metering laws allow a home system to overproduce during sunny summer months and “bank” the excess power needed to offset the dark winter season.

The downside of using the grid for storage of electricity is that if the utility fails, the PV system net metering must shut off—a safety feature designed to prevent electricity from being put into the grid during a power line problem, endangering utility and emergency workers.

Storage batteries may also be incorporated into system designs to provide outage protection or even complete autonomy from the utility grid. Batteries can be added to a PV system that are capable of storing enough electricity to provide minutes, hours, or days of reliable continuous power for dedicated emergency circuits up to entire households. A back-up generator (gasoline, propane, natural gas, diesel, or hydrogen) provides even a greater level of reliability and sustainability. Of course all of this value comes at a cost. A battery system for brief outage protection of critical loads (sixty minutes) might add \$1,000 to the price of a 3-kW system. A system capable of storing a day’s energy for an entire house may cost \$5,000.

Incentives Lower Initial Costs

Assuming an average cost of installing a 3-kW system at \$27,000, the cost per year, spread over thirty years, will be \$900. This system will generate an average of 5,475 kWhs each year at a resulting cost of \$.16/kWh. This is comparable to current electric rates in many utility districts today, and significantly less than in many other areas such as some islands in Hawai‘i. Moreover, this cost will stay fixed at \$.16/kWh for the thirty-year projected life of the system, while electric utility rates could skyrocket during the same period.

Now consider this same system in a

state with a tax credit such as California’s new 15-percent residential solar tax credit, along with a cash incentive program such as California’s 50 percent “buydown.” The cash incentive reduces the initial \$27,000 cost of the system to \$13,500; the solar tax credit further reduces it to a net cost of \$11,475. Now the unit price of electricity over thirty years drops to \$.07/kWh! Add the benefits of no property taxes for the improvement

utility districts and state agencies are providing cash incentives in the form of rebates, buydowns and grants covering 50 percent or more of the cost of qualifying solar equipment.

Long-term financing is readily available for the residential consumer in the form of fifteen- and thirty-year conventional real estate loans. With the lowest interest rates in forty years there has never been a better time to invest in long-term improvements

THE MINDANAO PROJECT

The largest solar energy project in the world will begin this fall on the Philippine Island of Mindanao. The photovoltaic project will produce enough electricity for 400,000 residents of 150 villages on Mindanao as well as sixty-nine new irrigation systems and ninety-seven drinking-water distribution systems. It will also power lights and medical equipment for 147 schools and thirty-seven health clinics, as well as seventy-nine new AC systems. The \$48 million dollar project is a joint effort between the Spanish government, the Philippine Department of Agrarian Reform and BP Solar, which currently produces 10 percent of the photovoltaic cells in the world. —EP

and the future cost of electricity saved (over \$33,000) with reliable high-quality electricity, and you can see why demand is huge. There are now several-month lead times for new PV systems in California, and “buydown” funds are being claimed.

Financing

Here are the most crucial financing tools available now:

Business Energy Credits: While there is currently no federal incentive available for residential uses of solar energy, there is a 10-percent business energy credit, together with a five-year accelerated depreciation deduction. This credit may be used by a person claiming a business use of the home to the extent that the solar energy system serves business electricity needs. Proposed legislation for a residential solar tax credit that could provide a similar benefit for homeowners is working its way through Congress (see access).

Solar Residential Tax Credits and Waived Permit Fees: Many states such as California and Hawai‘i have state solar tax credits that further reduce the costs of providing solar electricity. Other tax breaks such as sales and property tax exemptions, and waived building permit fees apply to solar electric systems. Local

such as solar energy generation systems. Fixed low monthly loan payment will be equivalent to a monthly utility payment; in most cases the loan payment may be less than the value of the energy savings, resulting in a positive cash flow from the very first day—at a “long-term fixed price” for electricity, something folks in California and elsewhere are desperately seeking.

Refinancing as a source of funds for a new solar energy system (for those who can take advantage of it) can be particularly advantageous. The combination of a lower interest rate with energy cost savings can result in a dramatically lower monthly payment and significant savings over the life of the loan.

Residential financing programs for solar energy systems exist in a variety of forms, including conventional real estate loans, equity lines, unsecured retail installment contracts, and credit cards. In addition, special loan programs offered in many states and local jurisdictions have lower rates and better terms than some conventional loan programs. For the most part, however, the conventional fifteen- and thirty-year home mortgage loan has the advantages of low fixed rates, no prepayment penalties, tax deductibility (in many cases), and easy



State	PBF	Gen. Disclos.	Port. Standard	Net Metering	Exten. Analysis	Contract. License	Equip. Certific.	Access Laws	Constr. & Design
Alabama									
Alaska								1	
Arizona		1	1	1	1	1	1	1	2
Arkansas				1		1	1		
California	1	1		1		1	1	5	4

www.dsireusa.org

access. There are dozens of lenders in every city and thousands now available through the Internet (see access).

Consider the purchase or construction of a new home. The \$11,475 amount from the example above, financed for thirty years at 6.5 percent, results in a monthly payment of \$72.53. This is less than the current utility electricity bill of \$75 per month based upon \$.15/kWh and will remain fixed at this amount for the duration of the loan regardless of how high utility rates go. This example could be further improved through replacing some roofing materials, awnings or patio covers with the PV materials. In California it is also possible to be credited for a higher amount for PV power generated during peak load hours, a good load match for PV systems. If electrical loads can be scheduled to off-peak hours the electricity consumed is only about one-third of the value of the on-peak PV generation. This means that a smaller PV system will be able to provide all of the dollar credits needed to offset the utility bill for the balance of electricity from the grid.

It's like being paid to install solar equipment, and homeowners are responding in droves—so much in fact that funds for cash incentives are being gobbled up, equipment manufacturers and installers are backed up for months, and staffs of incentive programs are inundated with new applications daily. New manufacturing capacity and trained installers are being brought online, but it remains to be seen whether supply can keep up with demand while endeavoring to bring costs down.

Carbon Taxes Would Help

New and existing incentive programs monetize “externalities” (such as

the environmental damage caused by fossil-fuel energy generation). “Emissions credits” generated from clean sources such as PV can be sold to polluters such as new or existing oil-, gas-, and coal-fired power plants. Even emissions from mobile sources such as cars and trucks can be mitigated. These benefits, paid for through pollution credits, thereby subsidize the costs for electricity generated from PV or wind. Lower PV costs look probable as the government agencies level the playing field between centralized power plants and distributed energy. Subsidies are heading in the right direction.

In addition, states such as Arizona, Texas, and Hawai'i have adopted renew-

able energy portfolio standards, requiring that a certain percentage of electricity generation be provided from renewable sources. Across the country, building codes and energy-efficiency standards are being adopted requiring state buildings, schools, and new residential and nonresidential buildings to incorporate solar energy systems to the maximum extent possible (see access).

Finally, solar is not just electricity. Solar tech for space heating and cooling, domestic hot water, fuel cells for vehicles, and process heating as well as electricity has continued to improve in performance and brought down costs. Add energy-efficiency (megawatts) and the solar alternative appears more and more to be the front stage financial choice.

Keith Rutledge, president of the Renewable Energy Development Institute (see access), has over twenty years experience in solar energy as a teacher, contractor, speaker, and consultant. He also has a banking background, with a decade of commercial lending experience. Keith and his wife Nancy Simpson live in an “off-grid” solar home that they designed and built in 1985.

ACCESS

SUN AND MONEY

RENEWABLE ENERGY DEVELOPMENT INSTITUTE (REDI)

Keith Rutledge, President
75 N. Main Street, #234,
Willits, CA 95490. 707/459-1256, www.redinet.org

REDI is a charitable, educational, and scientific nonprofit corporation specializing in energy policy and financing.

CENTER FOR RENEWABLE ENERGY AND SUSTAINABLE TECHNOLOGY (CREST)

http://solstice.crest.org

CREST provides one-stop access to national, state, and local renewable energy programs.

SOLAR ENERGY INDUSTRIES ASSOCIATION (SEIA)

www.seia.org

SEIA is the national association of the solar energy industry. Their website provides

access to local SEIA chapters around the country.

DATABASE OF STATE INCENTIVES FOR RENEWABLE ENERGY (DSIRE DBASE)

www.dsireusa.org

This online database from North Carolina State University's Solar Center tracks financial incentive programs for renewable energy all over the country.

CALIFORNIA ENERGY COMMISSION (CEC)

www.consumerenergycenter.org

The CEC website contains valuable information about photovoltaic systems, financing sources, and incentive programs for California and beyond. It also contains the Clean Power Estimator, an online tool for calculating energy system costs and benefits.

FINANCING

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The Federal National Mortgage Association is the largest holder of residential mortgages in the US. Their website provides information about conventional home loans, as well as access to lenders throughout the country.

VALLEY FINANCIAL

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www.fundingit.com

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ELECTRIC GAS INDUSTRIES ASSOCIATION

866/367-3442

WECC

800/969-9322

EGIA and WECC are providers of the unsecured Fannie Mae energy loan.

Full Recharge

Battery News

by Michael K. Stone

Battery-powered toys, watches, clocks, cameras, or flashlights give you many choices, but which battery is best? Standard alkaline? rechargeable alkaline? NiMH (nickel metal hydride)? or nicad (nickel cadmium)? Among rechargeables, the "second generation" of NiMH cells have just about rendered nicads obsolete. The NiMHs offer twice the capacity and don't self-discharge as fast—and they don't utilize toxic chemicals, as the nicads do.

That leaves the choice between NiMH and alkaline (standard or rechargeable). NiMH cells maintain their voltage level down to 10 percent capacity, making them the clear winners for *high-drain* gear, such as flash cameras and camcorders. Alkalines suffer voltage sags after heavy discharges, but will power moderate-drain devices longer. Because NiMH cells self-discharge over time, you can't always use them right out of the package—and don't count on them to power your emergency flashlight or radio.

The difference between the NiMH's 1.25 and the alkaline's 1.5 volts doesn't matter for most uses, but it can add up for gear such as boom boxes that need six or eight batteries. Of name brands tested by *Consumer Reports* last year, Radio Shack's performed best. (Real Goods is so confident that their NiMH batteries will outlive you that they'll replace them at no charge if they ever fail.)

Green batteries? Americans yearly truck three billion batteries to landfills, while the rest of the world adds a few billion more. If that fact doesn't motivate you to stop using throwaways, will saving money? Real Goods estimates that NiMH batteries cost \$.04 to \$.10 per cycle, including the cost of the recharger and electricity, compared to \$.90 to \$2.20 per one-cycle alkaline

throwaways. Rechargeable alkalines also cost more per cycle than NiMH, because at best they can only be recharged fifty times (and average twelve to twenty-five), but their cost still beats that of throwaways. The real market barrier: cost and landfill savings just don't motivate most Americans. We cannot discipline ourselves to take the extra time to recharge.

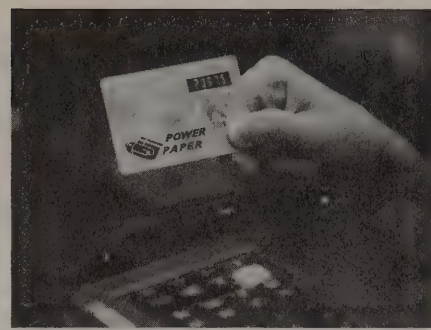
Toxics and recycling. Domestic manufacturers have eliminated mercury in batteries. *Consumer Reports* now says: alkaline batteries are safe to toss. But Real Goods still calls alkalines "low-level toxic waste." Nicads *must* be disposed of as toxic waste, though Real Goods sells them. (See www.rbrc.org for locations that will recycle nicad and NiMH batteries. We haven't heard of anyone who recycles alkalines.)

No more senior moments. Rechargeable batteries used to develop "memory" problems when recharged—causing them to lose the capacity to take a full recharge. That's no longer true. In fact, recharging the newer batteries before they're completely dead improves their longevity. Real Goods recommends recharging nicad and NiMH batteries when you sense the voltage is dropping (at about 10 to 15 percent capacity) and recharging alkaline batteries when they've run down about 50 percent.

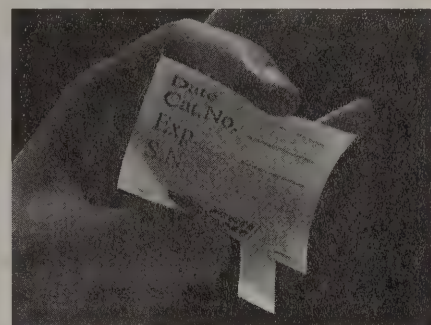
In short, avoid nicads, choose between NiMH and alkaline depending on use, and write us if you've discovered a way to make recharging fun.

Golden Power Nickel Metal Hydride Batteries from *Solar Living Source Book* (see page 22).

- 17-9173 4 Golden Power NiMH AAA 4-PACK. \$9.00
- 17-9173 8 Golden Power NiMH AAA 8-PACK. \$16.50
- 17-9174 4 Golden Power NiMH AA 4-PACK. \$9.00
- 17-9174 8 Golden Power NiMH AA 8-PACK. \$16.50
- 17-9175 Golden Power NiMH C 2-PACK. \$10.50
- 17-9176 Golden Power NiMH D 2-PACK. \$19.50



Sample of a smart card with battery technology inside the card. For instance, your battery-powered credit card could display your balance.



Sample of printable battery technology. The battery is paper thin, has no casing, is flexible, and can take any shape.

Printable Batteries

www.powerpaper.com

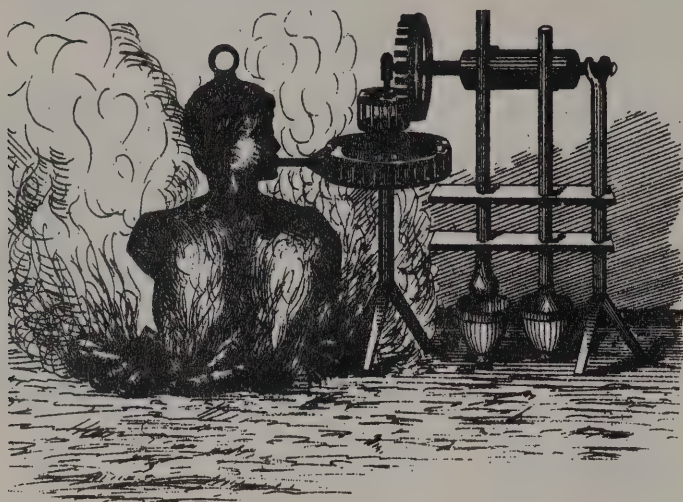
Thin, flexible, caseless batteries that can be printed on paper or plastic are about to debut. Power Paper™ Ltd. of Israel holds the rights to the 0.5-mm-thick battery. Its Hong King subsidiary manufactures novelty items with batteries silk-screened on greeting cards and mouse pads. A German company is developing battery-powered smart labels that can monitor the temperature of blood packages while in transit. The battery powers a system (including a microchip, thermometer, radio antenna, and transponder) that can read the blood's temperature and transmit the data to a nearby computer. They cost \$2 each.

The TFM (Thin and Flexible Microelectronics) process uses zinc and manganese dioxide cathode and anode layers separated by a layer of chemical power source. A one-square-inch printed cell, which can be produced for approximately one cent, will provide 1.5V with a capacity of 15mAh and a two-year shelf life.

The Unholy Triumvirate

Water, Energy, and Cash Flows

by Peter Warshall



ILLUSTRATIONS
FROM THE
GROWTH OF
INDUSTRIAL ART
(OUT OF PRINT)

On Earth, energy has been married to water for four billion years—in dew condensing to drops, in the feathered lightning of monsoonal clouds. The energy/water contract is inviolate, sealed by the laws of thermodynamics. Humans have fiddled with the marriage to enhance their well-being, but they cannot break it. Starting on the day we dreamed up money, the flows of energy and water became inseparable from flows of cash. Water, energy, and cash—an unholy triumvirate, a thoroughly interdependent, patterned, topsy-turvy system. Three aphorisms describe the system:

Every energy recipe says: “Add water.”

Every water recipe says: “Add energy.”

Every human/energy/water relationship says: “Add cash.”

Outside the kitchen window, energy/water and financial costs entangle hopelessly and hopefully. Small airplanes gas up to seed clouds. Neighbors move solar water heaters around the roof to catch the most rays. Kids open the hydrants to cool off without paying. A power plant steams off white

clouds into the sky's white clouds. A donkey in far off Niger walks in circles pulling a rope that lifts a bucket from the well. The purity of the waterflow coming home speaks to you as an electricity bill. Hopefully, the rapture of the water/energy wedlock momentarily overwhelms the fractiousness of broken pledges—to be kind and do no harm to others who are joined by the water/energy marriage.

This essay is a little elemental marriage analysis as I attempt to play matchmaker, counselor, pastor, diplomat, and cheerleader for greater harmony.

Every energy recipe says: “Add water.”

All the fuels (biomass, geothermal, hydrogen, uranium, coal, natural gas, petroleum) that convert water to steam to drive turbines and create power survive by water.

Distant watersheds provide the water to harvest and mine fuels. Water controls dust, replaces withdrawn petroleum, slurries coal, or, most voluminously, restores mined landscapes. Other watersheds sustain factories that concentrate “dilute” ores like uranium; refine mixed fuels like petroleum crude; clean “dirty” ores like high sulfur coal; irrigate crops for biofuels; or turn silicon into photovoltaic solar cells. Still other watersheds support the aquatic-powered transport of enriched fuels by slurry, navigable river, train, or truck.

Finally, the greatest thirst occurs in the watershed of power plants. Here, water has three big uses: Water to create steam to spin the turbines that generate electricity (“boiler water”); water to cool the waste heat and maintain the boiler pressure so the power plant won't explode (“condenser” and “cooling system” water); and, in coal-fired plants, water to clean the noxious sulfur fumes from the smoke (“scrubber water”). Boiler water for power plants and factories is the second largest US user of water after agriculture.

Shortages of water at any of these stages can stop the flow of electricity, information, goods, and services, and increase the cost per kilowatt.

Matchmaking

The water/energy marriage requires us to rethink what's "best." Any form of energy must be wed to water, but as compassionate humans we seek to meet our energy needs through a marriage that demands as fair a water dowry as possible.

The marriage is not a nostalgic quaint arrangement like water wheels with grain mills in pastoral English countryside. Ninety-eight percent of the current US energy mix must still be paired to the appropriate watershed. Local waterflows and weather still dictate the water/energy matrimony, especially the choice of mine sites, power plants, fuel types, and cooling systems. Only the remaining two percent—wind, solar, thermal, fuel cells, and photovoltaics—ease up on the demands for water to help generate power. Once installed, wind, fuel cells, and solar have no dependence on large water flows for cooling and processing.

So let me matchmake a few power sources and water.

Nukes and water: I always wondered why nukes occupy the most beautiful riverside real estate on the Columbia River or the seacoast of California or New England. In their 1990 nuclear plant designs, sites were chosen because the plants consume 20 to 30 percent more water-flow per kilowatt than fossil-fuel plants. The nuke/water marriage requires large water bodies to prevent blow-ups. For safety, nukes combine energy and water at lower temperatures and pressures, making them less-efficient converters of fuel to steam. This inefficient relationship releases more heat, and needs more water to stay cool.

The community (all marriages are community affairs) may disapprove of the nuclear power because of radioactive waste, plant security, or costs. In my role as marriage counselor, I would add the huge water dowry. Even coal, the bugaboo of

climate change, would make a better husband for water, saving billions of gallons of waterflow yearly, even after consuming more water for sulfur removal. Nuclear engineers, sensing the difficulty of new nukes finding a watershed home, have proposed the water-saving pebble reactor (see page

POWER PLANT THIRSTS

A 1,000-megawatt coal-fired power plant has a boiler that consumes 300 pounds of coal each second. It powers a city of 700,000 which, at the moment, has turned on 5 million 100-watt light bulbs, 500,000 refrigerators, and 500,000 TVs. Operating at 70-percent capacity and using wet towers to sweat away "waste heat" from the boilers, the power plant consumes 9 million gallons of water each day for cooling and another million for sulfur removal.

40) to keep their lineage alive.

Hydropower would seem to be the perfect match for energy. After all, water is both the kinetic energy spinning the turbines and the "fuel." How intimate! No boilers. But reservoir water has a hidden dilemma. In the arid West and arid nations like Egypt, reservoirs can consume more gallons per kilowatt than do the cooling towers of nuclear power plants. Tens of thousands of gallons of water, sitting behind dams waiting to spin the generators, evaporate under the desert sun.

And this marriage is always contentious, as downstream fish, farmers, crops, and factories want water at times that conflict with hydropower demands. The hydropower marriage is filled with carping family members.

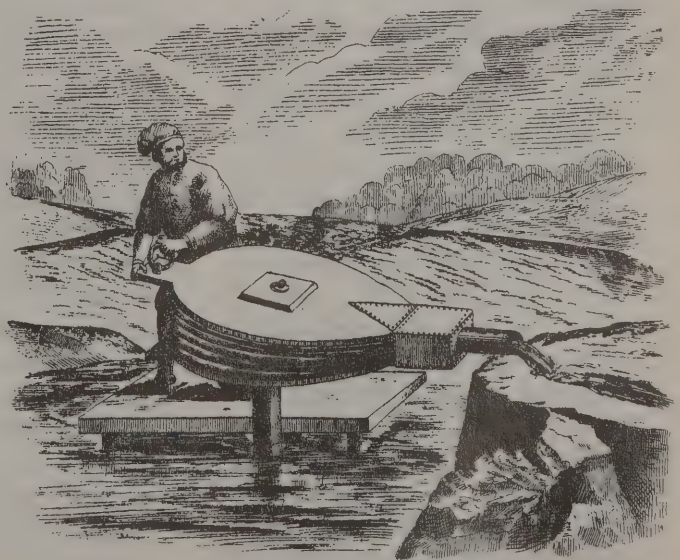
Geothermal steam generators seem to be "free," already packaged marriages from deep earth. Perhaps, a Las Vegas special. Steam zooms out from the earth, spins turbines, and escapes to the atmosphere. But the marriage can end abruptly. Once the geothermal steam is "mined" out, the power plant must close.

The water cost per kilowatt has been more than reservoirs or nukes.

Only recently have a few geothermal plants tried to prolong the union by recapturing and returning condensed steam back to their geothermal wells. In Sonoma, CA the hot rocks of water-poor geothermals

have begun to run dry. A hungry utility proposed a \$40 million project that would inject all the county's treated wastewater into the deep earth so it can boil back to the surface and spin turbines. Marriage counselors take heed. Do we want more geothermal energy or more water in the river? Who's to decide?

Biomass fuels, in arid lands, suffer from problems similar to hydrodams. Biofuels can require irrigation that is water-intensive per kilowatt hour. If the water must be pumped to the fields, then we need water/energy to run the pumps plus water/energy to grow the crops plus



water/energy to gassify the biofuels back to energy. Is this always better than thermal power plants?

Fuel cells. The Apollo program worked intensely to optimize the water/energy union in outer space. Water is a petite resource out there. Matrimony occurred in an alkaline fuel cell that was compact and reliable. The hydrogen and oxygen traveled in Apollo in a cryogenic form (frozen), and the fuel cell “waste” product, water, served other purposes within the capsule.

water will accept no more) is the moment where you’ve used up water’s potential to chemically “bind” the sugar into solution. The water’s worked, absorbing and holding the sugar in solution, and has now exhausted its potential.

Purifying water is the opposite process. It’s taking the sugar back out of the water. Purifying requires active energy as well as the discipline and tools to undo water’s grip on sweets and poisons. All kinds of energy—

ble or triple time. We invent machines such as wastewater and desalinization facilities. We construct giant stirring rods to mix more air into sewage so that bacteria will eat and digest wastewaters faster. We mimic the sun with chlorine or ozone gases to destroy harmful bacteria. We mimic soils that filter and absorb toxics with charcoal filters that need furnaces to reactivate their cleansing powers.

For instance, a town of 7,000 might have a sewage plant containing four pumps, sludge thickeners, and a chlorinator. Treating 1,250,000 gallons of daily sewage will require one million kilowatts of electricity over a year’s time. This equals about 175 tons of coal and 410,000 gallons of water for mining and processing the fuel and cooling the power plant. (It does not include the energy needed to manufacture the chlorine.) The operating costs of this town’s sewage bill are about 80 percent electricity.

Towns and cities can deal with the energy needs for clean water by finding less energy-consumptive methods of sewage treatment, like John Todd’s Living Machines or nanotech membranes; and by water conservation that reduces the volume of sewage. But this marriage has a sinister aspect. To save on energy costs, some towns and cities prefer to spend money lobbying for ways to let water remain dirty. They shun the marriage counselor and wastewater treatment and harm the conjugality of watershed love.

Salt water and war

The most energy-intense marriage of the water/energy union can be found in desalinization plants. They guzzle so much energy that desalinators operate only in locations with excess petroleum, or where waste heat from power plants (especially nuclear and geothermal) can be recycled. About 60 percent of the world’s desalinization plants dwell in the Middle East. Saudi Arabia produces 50 percent of all distilled water on the planet; distilled water makes up 70 percent of the kingdom’s potable water supply. The city of

How much water does it take to heat or cool your home? In central Michigan, for instance, your detached home with insulation, weatherized windows, etc., may receive electricity from high-quality coal, converted to synthetic gas. Your household indirectly consumes 20,000 gallons/year of water just to convert the coal to syn-gas for the heater; and another 10,500 gallons to generate the steam-powered electricity for the toaster, TV, light bulbs, and dishwasher.

Performance was 70-percent efficient, which is better than most of my relationships.

In the future, the fuel cell marriage will become regenerative. Using photovoltaics, the “waste” water will be electrolyzed to H₂ and O₂ during the day; at night, they will be reused to produce electricity. If the water/energy wedlock is to be rapturous, then the fuel cell is our most perfect model of wedlock.

Every recipe for clean water says: “Add energy.”

Dirty waters and saltwater have little potential for long-term human relationships. It’s clean water that sustains. The active agent in this marriage is energy, and understanding the relationship requires reference to those inviolate rules of thermodynamics.

High-quality freshwater has more potential energy—the ability to assimilate salts and other chemicals—than polluted water or saltwater. Clean water has more inherent energy to do work. Concoct rock candy, for instance. Dissolve more and more sugar until the water refuses to dissolve any more. (That’s when you add the wick to crystallize the candy.) This point (at which

mechanical, biochemical, radiant—can take “exhausted water” and restore its potential (which is perhaps why “purity” has such metaphorical moxie). To repeat, every recipe for clean water says: “Add energy.”

The work necessary to take pollutants out of the pollutant/water union is especially hard. Water dissolves and holds onto more substances than any other liquid on Earth. It is the “universal solvent” (i.e., pretty promiscuous).

To help purification, there are probably as many “dirty water counselors” as there are therapists and pastors dealing with human relationships. They too become specialized, mainly as divorce counselors to help exorcise salts, metals, toxics, or nutrients. Dirty waters support a booming legal and consulting growth business. Looking for a job? The future lies in purifying water with low energy inputs.

The problem is that nature takes its time. When nature purifies, its schedule can’t be rushed and can’t be located at just the spot where it’s most convenient. To clean water faster and more predictably than the sun, rivers, microbes, plants and soils, we humans try to mimic nature’s ingenuity at dou-

Riyadh pipes in desalinated water from from the Gulf, 300 miles away, in a grand extravagance of energy-intensive pumping plus energy-gluttonous purification. Because of its energy burden, desalination produces only one-quarter of one percent of all drinking water.

But desalination is a grand tool with huge security implications. Desalination remains the wet dream of the Middle East, a “peace pipe” to end 5,000 years of bickering. Could the correct water/energy design become the permanent road to peace? Picture the Saudis constructing a pipeline to Palestine for their crude. The refinery would employ Palestinians who would sell a portion of the resulting petroleum as fuel (with boat transport through the Mediterranean), and use the rest to desalinate saltwater. They would sell the freshwater and gasoline to their own people and to Israel, which would employ Palestinian farmers and sell produce back. Water and energy would forge a cash/water/energy union, a holy triumvirate. It’s worth a try. No other strategy has stopped the war, torture, property damage, revenge, and so much sadness.

Every recipe requiring water says: “Add energy.”

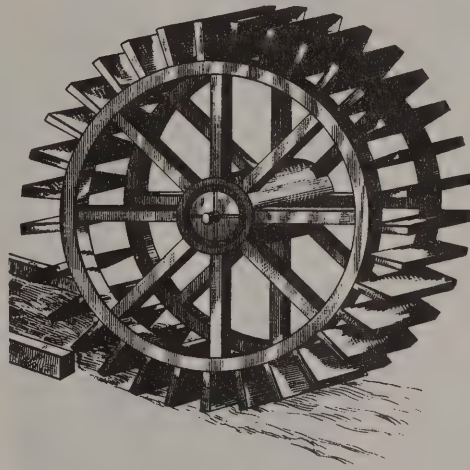
It would be pleasant if water behaved like a dog. “Here, Water. Here!” and water would flow to your feet. But water’s untrainable. Within three days, you must spend the energy to bring yourself to water.

For millions of years, humanoids and humans took themselves to the water, because carrying water took exorbitant personal energy and adequate containers were hard to come by. Water is heavy and bulky—8.3 pounds per gallon. But we wily creatures have always looked for water to be the dog, to come to us on demand. This aspect of the water/energy marriage says: to transport water requires energy.

Five to ten thousand years ago, to convey more water more quickly for

longer distances, oxen, horses, donkeys, burros, and camels replaced Jack and Jill. Beasts of burden bore large clay ollas and waterproof bags. Many times, water transport meant survival. Apaches evading American armies had a reputation for riding one horse to death, then skinning out its intestines, filling the intestines with water, slinging them over another horse’s neck and riding on. Horse gut “canteens” and horsepower meant freedom.

Today, industrial energy moves water from wells beneath the earth, from



river channels and over hills. Airplanes consume fuels and spray chemical “seeds” to move water from clouds to earth. Ships transport gallons to isolated islands, or pull icebergs to Arabia.

Forty percent of all water used in the US ascends 100 to 300 feet before use. Some pumps lift water from 3,500-foot wells. Other pumps push/pull water as high as 2,000 feet in pipes crossing mountain divides.

The planetary super-marriage occurs at Tracy, California where millions of acre-feet of northern Californian water are lifted and shunted as far away as San Diego. Six pumps at Tracy, energized by twenty-two 500-horsepower electric motors, can lift 5,800 gallons a vertical distance of 200 feet each second. That’s about twenty-four tons of water (think five African elephants) ascending 200 feet each second before being dumped into aqueducts. In a typical year, the Tracy pumps lift about 2.2 million acre-feet and

consume 575 million kilowatts, enough electricity to power 80,000 homes for the year. California droughts have become droughts of energy even more than of rainfall.

So what makes this aspect of the water/energy marriage more graceful? Shorter distances and heights. The closer to home your water source, the less work needed to enjoy hydraulic pleasures. The more you rely on gravity, and the less you pump, the more energy is saved. As cities sprawl, the future energy/water relationship will strain and, at times, rupture. The next twenty years will need to find ways to collect and recycle water onsite and rethink water uses so we don’t transport high-quality water hundreds of miles for trivial purposes like flushing toilets and washing streets.

Cash

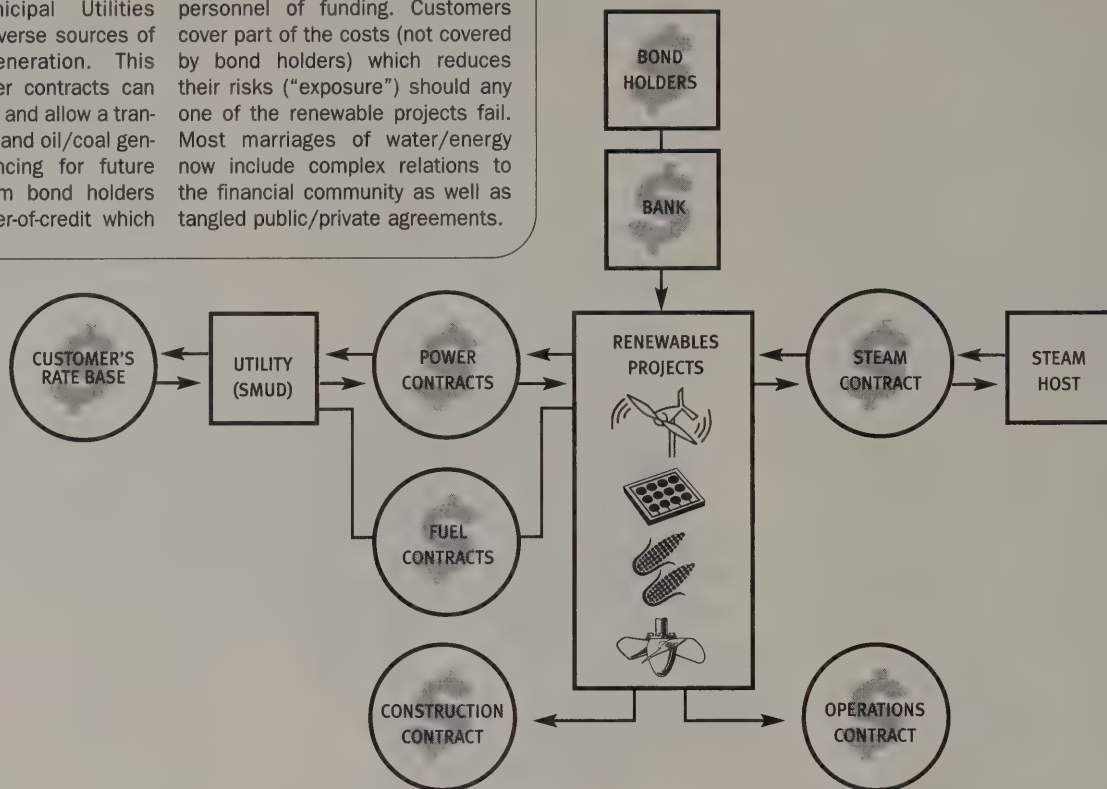
During the 1970s drought, San Francisco citizens conserved so much water that their water bills shrank and the utility could not garner enough revenue to pay its less elastic costs (water treatment and pumping and labor). Citizens did such a good job saving water that the utility raised their water bills! In another coastal town, the citizens conserved water and recycled graywater so efficiently that the remaining sewage became too viscous, and hardly moved through the pipes. Odors and mosquitoes burst from the perforations in manhole covers. At night, the utility secretly opened hydrants and poured precious drinking water into the sewers to flush the pipes. To encourage conservation it hid the truth. Effective conservation meant investing in a whole new system of pipes, not just low-flow appliances.

Cash can upset the energy/water marriage. It’s not cash’s fault. From a system’s point of view, cash flows configure and connect differently from water and energy flows. Cash belongs to the totally human financial community of investment capital, taxes, subsidies, grants, contracts, international loans, shareholders, and price competition. The financial community has a

THE UNHOLY TRIUMVIRATE WATER, CASH AND ENERGY FLOWS TANGLE IN COMPLEX REALITIES

The unholy triumvirate at the Sacramento Municipal Utilities District includes diverse sources of power and cogeneration. This means many power contracts can include renewables and allow a transition from nuclear and oil/coal generation. The financing for future energy comes from bond holders and a bank's letter-of-credit which

assures contractors and operations personnel of funding. Customers cover part of the costs (not covered by bond holders) which reduces their risks ("exposure") should any one of the renewable projects fail. Most marriages of water/energy now include complex relations to the financial community as well as tangled public/private agreements.



life of its own (interest, profit, depreciation). Profits are tied to selling more water or more energy—a feedback destructive to nature. In addition, higher-quality water usually costs more. Interest and depreciation rates have yet to include the restoration of natural capital (fuels, water) instead of asset capital.

Even deeper, water and energy are not strictly commodities. They have lives as entities, as events valued in themselves. The beauty of a waterfall is not the same as that of a dammed lake. I remember Hawaiian native friends fighting the Vatican, which wanted to tap their sacred geothermal vents. The steam was alive and historic and full of meaning. The difference between free and harnessed could not be measured in money.

Similarly, water and energy have a basic human rights value. No one should die of thirst or drink contaminated water. No one should freeze or

collapse of heat exhaustion in their home. If some citizens can't afford these minimal comforts, it is the nation-state or private utility that must provide them—no matter how it hurts profits.

When the financial community tries to commodify the sacred and the humane, it twists and reshapes the water/energy union. At the moment, it's all denial, a dysfunctional marriage with a conceptual wall separating the "water" partner from their "energy" partner and both from their accountants. Californians wryly summarize the water/energy/cash histrionics with their famous one-liner: "Water flows downhill, except when it flows uphill towards money."

In short, the existence of the unholy triumvirate calls for a new contemplation, a thoughtfulness about connections and configurations of everyday events and things in nature and society. In staring at

beautiful whirling eddies and reverse waves in the Grand Canyon, rafters taught me to first see how the patterns of the Colorado's water/energy could convey us through rapids. They also made clear that the intensity of the flow had to do with the price of electricity upstream at Glen Canyon dam. One could look inside a refrigerator with the same eyes: one view for the amazing ability of an energy system to make ice from water, and another at the monthly bill. Once, in fact, I was asked by Allen Ginsberg to explain to a newly immigrated Tibetan monk how a refrigerator made ice, and stuttered my way through an explanation of the energy/water marriage. He laughed, poked his head deeper inside the 'fridge, and said: "Yes, elements together is thinking of the sacred." He patted this nice machine made of earth, water, energy, and air; and I decided to write this essay. ☪

The Unholy Triumvirate News

by Peter Warshall

LOW-FLOW TOILETS

Using less water to flush saves both water and the energy needed to purify it. Probably one of the oddest rituals of our culture has been expensively purifying our water to the highest quality to flush away piss and shit.

A compromise was the 1.6 gallon flush (less-high-priced water)? But what happens over time to low-flush toilets? The Tucson Water Resources Center checked. After a few years, the low-flushers became more like two-gallon flushers because of flapper leaks, double flushing, altered toilet dams, and poor replacement or fiddling with the tube-and-bulb types.

The pressurized toilets did better than gravity flushers, but some users hated them (they're damned noisy). Halogenated bowl cleaners (the blue goo) ate at flappers and caused leaks. They're water wasters.

Flush buttons on the top of the tanks (e.g., American Standard Fontaine) are "for adults only." (Ever see a three-year-old forget to close the lid and climb onto the toilet seat to reach the button?)

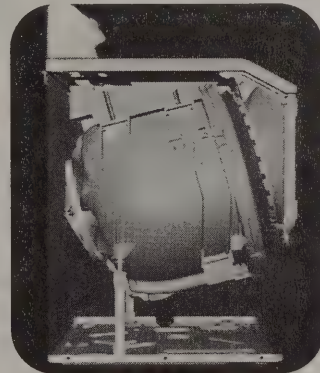
Low-flush toilet designs need some help. They need cast-in toilet dams that can't be jiggled, with fittings that will not accept 3.5-gallon parts, and toilets where flush-up is for liquids and flush-down for solids.

Consumer Reports's best buy is the pressure-assisted Gerber Ultra Flush 21-302 (about \$270); They rated Eljer Berkeley 081-159s as the best expensive (about \$420) gravity flush and Eljer Patriot 091-1125 the best lower-cost (\$120 to \$200) gravity flush.

GREENER LAUNDRIES ARE COMMUNAL

The Multi-house Laundry Association (473 Mani St., Suite 200, Longmont, CO 80501) found that

coin-operated common laundries use just a third as much water as in-apartment facilities. Directly paying for each use, the large volume of each of the shared machines, and inconvenience all add up to water conservation, and more interaction with neighbors. Common-area washing machines sucked down 3,588 gallons a year per participating apart-



ment (69 gallons per week), while in-apartment washers used 11,804 gallons (227 per week).

If you are a home washer, Maytag's Neptune (www.maytag.com) and even better (and more pricey) Asko (www.askousa.com) now provide greener washing: less water, less energy, lower costs, and lower greenhouse emissions—the RMI mantra for a win-win technology.

DEMAND WATER HEATERS

Some 80 billion gallons a year are wasted while you empty the cold water from the faucet and yearn for the warm. No one has calculated the

In a pressure-assisted toilet, air inside the special tank expands when you flush, adding force to a lower volume of water to help push waste away.

wasted energy of heating water that just sits in the pipes and cools off. Latin America and Europe figured out this no-brainer decades ago, with on-demand heaters that sit near the faucet. No heat loss, no water wastage. For more information, see www.eren.doe.gov/consumerinfo/refbriefs/bci.html.

DAMMED DEREGULATION

How Deregulation of Electric Power Industry Could Affect the Nation's Rivers
Charlie Higley. 1999; 18 pp. \$10.
202/588-7780, or read online at www.citizen.org/cmep/restructuring/damfinal.htm.

Is hydropower really green, with all its impacts on rivers, fish, riparian zones, and deltas? Is hydropower really renewable with climate changes? Can Canada's rivers be shunted to the US by NAFTA rules? What's happening to deconstruction of dams? A muckraking pamphlet at the water/energy nexus.

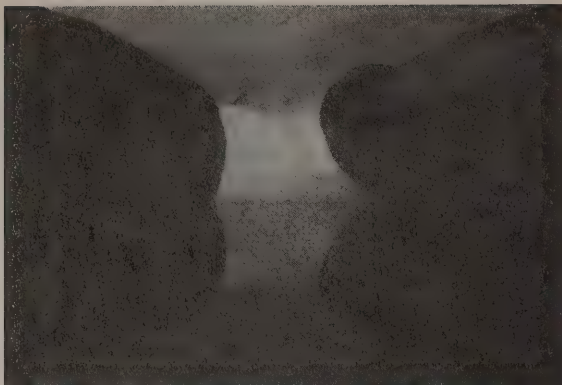
AIRWELL SOLAR DISTILLERS

Airwell Survival Kit \$79.95 (\$89.95 post-paid), *VHS set-up instruction video* \$19.99 (\$23.99 postpaid). Tilted Planet Productions, PO Box 10965, Zephyr Cove, NV 89445. 775/588-4147, www.airwellinc.com.

The Airwell renders up to seven pints of drinkable water a day from soil moisture (or brackish or sea water). The company says it's been successfully field-tested in desert and dusty conditions. In order to collect enough moisture, you need to dig a hole 30" to 40" deep and 40" to 100" in diameter (short-handled plastic shovel included). The portable "Survival Kits" are Y2K leftovers available at reduced prices. The company is about to start selling plans and components for household- and industrial-sized systems that will recycle existing gray water while replacing lost water with Airwell-extracted water from soil moisture. ("If you can build a model airplane, you can construct an Industrial Airwell for your own use.")

Gravity flush toilets work with a float, a flapper, and an overflow tube. The weight of water pushes waste down the drain. Dams to prevent full flush and quick-close flappers make for low flushes.

Left: Cutaway of the new Maytag Neptune washer showing the inner tub—tilted upward by 15 degrees for improved visibility and reach.



"PATAGONIA," MARIE WILKINSON/CYRIL CHRISTO

Writing on Water

I've been drawn to water all my life. I've spent years messing around in little boats, paddling kayaks, rowing rafts, navigating rivers, trying to penetrate the mystery of moving water, following the primal instinct back toward the universal womb. I don't think there can ever be too many words written about water.

I was instantly at home with this collection of water writings, which encompass science and fiction, poetry and prose, and a collection of aphorisms that float on the mind like the foam on a breaking wave. Good writing flows like water, and this book gushes with torrents of words that dance and ebb and eddy and swirl.

The best writing, like a wild river, is indifferent to the presence of the reader: it occupies space on its own terms but it takes you someplace important. I was delighted to find passages in this book that led me into places I've never been, and other passages that welcomed me home to places I know and love.

Writers include Octavio Paz, C.L. Rawlins, Malcolm de Chazal, Hugh Dunkerly, our own

Peter Warshall, the incomparable Freeman House, and many many more. I found myself dragging this book to bed with me night after night. It reminds me that we are bonded to, organized around, in relationship with, dependent upon, and ultimately saved or savaged by water. —David Bolling

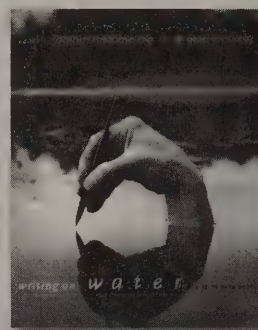
"Foam swims with its fingers. Airy-tentacled, foam is a cuttlefish on the surface of the sea. We all know what it is like to plunge our hands into foam, thousands of little feelers clutching us like the arms of an octopus. A giant spider of water lying in wait to embrace its liquid-fast prey, foam is the sweeper of streams and the brusher of lakes. —MALCOLM DE CHAZAL, "WATER APHORISMS"

"But it's not light you're carrying said the moon

it's water the live weight of water a basin you lift slowly —JODY GLADDING, "TIDAL"

"If you listen carelessly, the water in a rushing river sounds like a single thing with a great fullness about it. But when you begin to try and sort out the sound of one thing within the sound of the water, the moving water breaks into a thousand different sounds, some of which are in the water and some of which are in your mind.

—FREEMAN HOUSE, "IN SALMON'S WATER"



Writing on Water

David Rothenberg and Marta Ulvaeus 2001; 288 pp. \$24.95 MIT Press/A Terra Nova Book

Water

So many books have been written and published about the impending global water crisis that a BBC wag was recently prompted to remark that "if the thirsty could drink words, there would be no problem." So why another book?

Because Robin Clarke says it all—briefly, clearly, and persuasively—and provides a useful guide, through footnotes, to the ponderous bibliography of studies, reports, and white papers that burden the shelves of water wonks from the Cheerapungu to the UN.

Water provides a terse, thorough account of the global squandering and mindless destruction of our most vital resource. Scarcity is documented, crises predicted (particularly in Africa), and solutions large and small are offered.

Like so many environmental writers these days, Clarke is both alarmed and hopeful: alarmed at the growing deficit of clean, usable fresh water; and hopeful that ways will be found to allay the frightening specter of permanent global

drought. While the solution is clearly political, it is not Clarke's intention "to invent a political programme that will bring water to the forefront of the world's action agenda. It is to illustrate the urgent need to do so." And this he does masterfully. —Mark Dowie

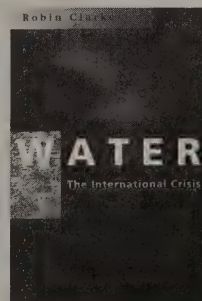
"China. Fifty cities face acute shortages; water tables dropping 1–2 meters per year; farmers in the region could lose 30–40 per cent of their supplies to domestic and industrial uses....

Mexico. Groundwater pumping in parts of the valley containing Mexico City exceeds recharge by 40 percent, causing land to subside; few options exist to import more fresh water....

[Former] Soviet Union. Depletion of river flows has caused the volume of the Aral Sea to drop by two-thirds since 1960; irrigation plans have been scaled back; high unemployment and deteriorating conditions have caused tens of thousands to leave the area.

United States. One-fifth of total irrigated area is watered by excessive pumping of ground water; roughly half of western rivers are over-appropriated; to augment supplies, cities are buying farmers' water rights.

"Japan has given an old technology yet a further twist by resorting to the use of rubber, inflatable dams, filled either with air or water. More than 1,000 are now installed, providing irrigation water, flood control and groundwater recharge. One of their major advantages is that that can be deflated, allowing accumulated silt to pass out of the reservoir and flow downstream. The dams are anchored to the riverbed, and can be used to span distances up to 135 meters. One 40 meter wide dam in the Mekata River is two meters high and is used to generate electricity. The technology is to be exported to both south-east Asia and Europe.



Water The International Crisis

Robin Clarke 1993; 193 pp. \$19.95 MIT Press

Ultraviolet for Health

A low-cost local water disinfectant

by Emily Polk

Contaminated water is the world's single largest environmental killer. From his small office in the Lawrence Laboratory, Berkeley physicist Ashok Gadgil explains: "Four million children die annually from waterborne diseases; more than 400 deaths per hour. It's the kind of death toll that we don't jump up and down about because it's out of sight to us."

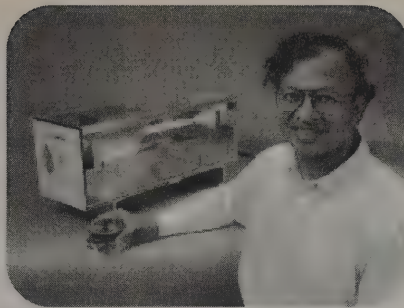
In the 1950s, while growing up in India, Gadgil watched five of his cousins die from drinking contaminated water. Later he learned that over a billion people around the world live without access to safe drinking water. "You know there's an important question that you always end up asking yourself," Gadgil said, "Where can you really make a difference? I always knew I wanted to do something about this."

Gadgil, a soft-spoken man with a kind smile, worked weekends and nights with scraps of funding and a few volunteers to build UV Waterworks, an ultraviolet water disinfectant that can clean up to four gallons of water per minute.

Ultraviolet disinfection uses approximately 20,000 times less primary energy than the standard alternative of boiling water. It works because the ultraviolet light deactivates the DNA of bacteria, viruses, and other pathogens, so that they are unable to live in the water. Exposure to UV energy for about twenty seconds is enough to deactivate 99 percent of the pathogens.

The disinfectant itself looks like a little gray plastic toolbox with a UV lamp that can burn for up to 10,000 hours, an aluminum reflector, and a stainless steel lower pan. It weighs only 15 pounds and can run on less than 60 watts of power.

UV Waterworks has a lifespan of about fifteen years. If there is no electrical hookup, it can use the ener-



FROM WWW.LBL.GOV/WONDER/GADGIL-2

gy from a car battery, solar cell, or bicycle generator. The disinfectant can supply potable water to a thousand people at an annual cost of five US cents per person in the village.

"Cost was really important to us in this design," Gadgil said. "How could you have 400 kids an hour dying for decades and at the same time have all the technical means to give water to them at five cents a day? You have to ask what's going on here. Where's the flaw?"

The whole unit has a one-time capital cost of \$300, including materials and labor. If the system operates for twelve hours a day, about 4 million liters [over 1 million gallons] of water can be disinfected every year.

The US Department of Energy, working with a binational commission to support the new democratic government in South Africa, funded one of Gadgil's first projects at a children's AIDS orphanage in Durban. A photograph of the South African children hangs near his desk. "The

children and the couple who cared for them didn't have any sewage system. They had big drop toilets which contaminated all of the drinking water."

Diarrhea incidences dropped 93 percent in Los Mogotes, Mexico after a Waterworks purifier was installed, according to data from a local doctor.

UV Waterworks is licensed to WaterHealth International (WHI). The company also offers a retail opportunity for locals who want to open up their own water store. For a small fee, WHI will provide the equipment for a water store. In a village near Manila, Philippines, the water store sells water for half the price of big-brand bottled water. The money earned recently went toward building a new roof for the school.

Currently, there are more than 100 Waterworks purifiers in Mexico, just under 100 in the Philippines, and about 100 more scattered through thirty different countries, including Nepal, India, and South Africa.

"Today 1.2 billion people don't have clean drinking water," Gadgil says. "Now 200,000 more people are currently getting some. We ought to go from 200,000 to 200 million if we are going to make a dent. But it's a start."

WATERHEALTH INTERNATIONAL, INC.
1700 Soscol Avenue, Suite 5, Napa, CA 94559.
707/252-9092, www.waterhealth.com

NONPROFITS THAT INSTALL AND OPERATE UV WATERWORKS IN DEVELOPING COUNTRIES

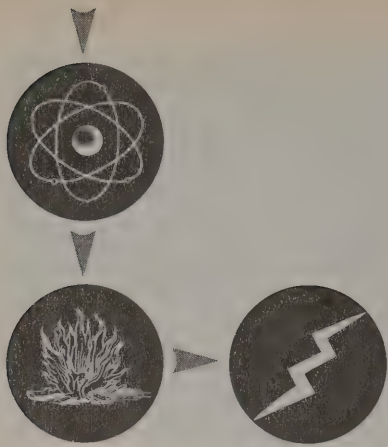
**WATER PARTNERS
INTERNATIONAL**
c/o Gary White
PO Box 654,
Columbia, MO 65205.
573/447-2222,
www.water.org

**NATURAL RESOURCES
DEFENSE COUNCIL**
c/o Peter Miller
71 Stevenson Street, #1825,
San Francisco, CA 94105.
415/777-0220,
www.nrdc.org

CLEARWATER PROJECT
c/o Sean Ebnet
Higher Ground
for Humanity
PO Box 9002,
Carlsbad, CA 92018-9002.
www.clearwaterproject.org

ENERSOL ASSOCIATES
c/o Eric Johnson
55 Middlesex Street, #221
N. Chelmsford, MA 01863.
978/251-1828,
www.enersol.org

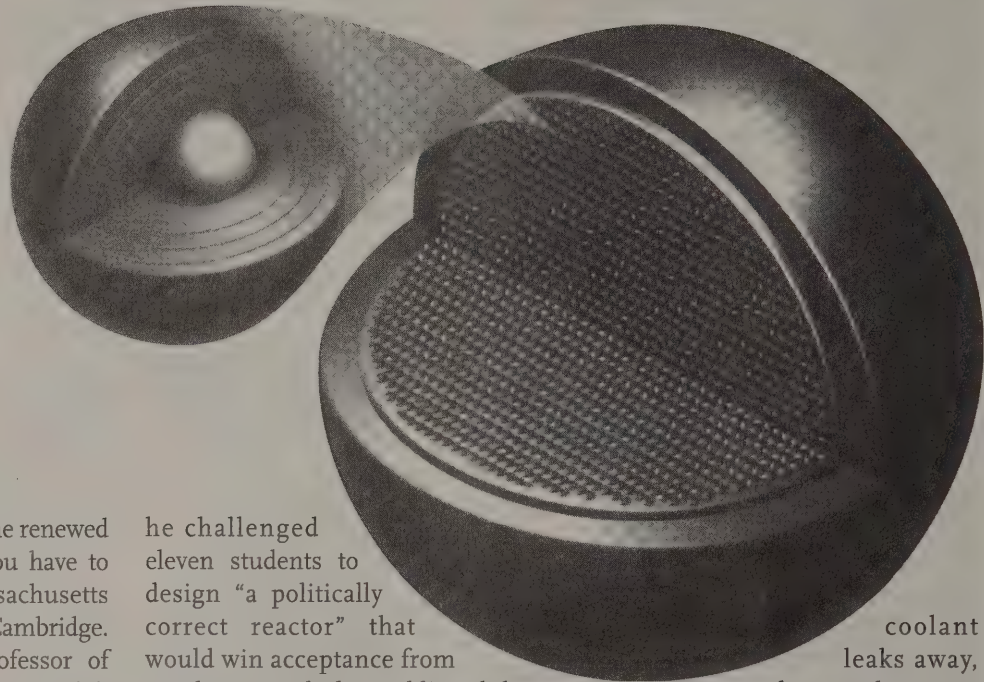
Ashok Gadgil and the UV water disinfectant he invented.



The Politically Correct NUKE

MIT Students help design a nuclear power plant that they hope will revive the industry.

by Charles Wardell



Above right: A “pebble” (about eight-ball size) containing 10,000 uranium dioxide particles the size of a pencil point, each coated with several layers of graphite and a silicon carbide outer shell (inset). Though the pebbles heat to more than 1,000°C, the coatings trap the radiation inside. The particles decay within 250,000 years, but the graphite ball maintains its integrity for more than one million years.

To truly understand the renewed buzz for nuclear, you have to travel to the Massachusetts Institute of Technology in Cambridge. Here, Andrew Kadak, professor of nuclear engineering, holds two billion-size balls that many believe represent the future of nuclear energy. The balls are the “pebbles” in something called a pebble bed reactor, a new type of plant that proponents say is safer and more efficient than current plants. It could even crank out electricity for less than a gas-fired plant, savings that would presumably be passed on to you. More important, considering our anxiety toward nuclear energy, it’s immune to meltdowns. The technology could be implemented, possibly at Three Mile Island, within five years.

When Kadak, formerly vice president of the American Nuclear Society, came to MIT in 1997, nuclear power seemed doomed. So in January 1998,

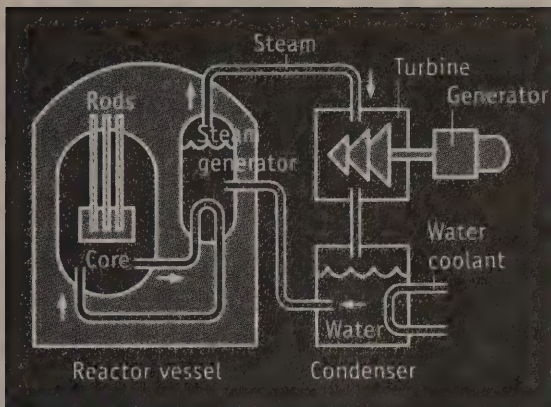
he challenged eleven students to design “a politically correct reactor” that would win acceptance from regulators and the public while giving gas a run for its energy-generating money.

All existing US commercial reactors are “light water” reactors. They’re powered by half-inch cylindrical pellets of uranium—like cutoffs from a 1/2-inch dowel—stacked up in 14-foot-long metal rods. Hundreds of rods are lowered into a water-filled reactor core. The uranium atoms give off neutrons, some of which crash into other uranium atoms, splitting them, generating heat, and knocking free more atom-splitting neutrons—the process known as fission. The water in the core carries the heat away to drive an electric turbine.

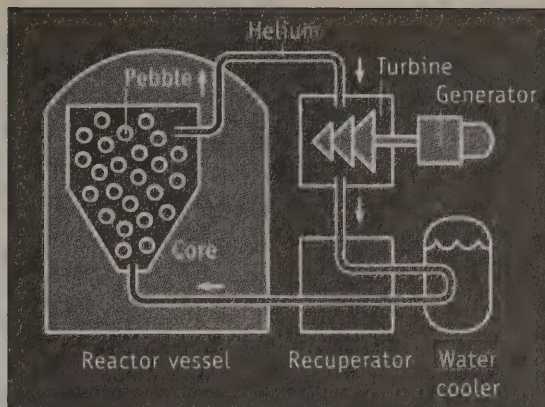
Kadak’s students rejected light-water technology for this reason: If the

coolant leaks away, the core heats up enough to melt. Instead, they found something they considered safer: a pebble bed research reactor that had run for twenty-two years in Germany (“until Chernobyl came along and Germany got out of nuclear,” Kadak says). It relied on fission too, but was fueled by eight-ball-sized pebbles, and rather than water coolant, it used helium gas.

The main safety feature is the fuel itself. Each pebble consists of roughly 10,000 “microspheres” of uranium dioxide the size of a pencil point. Each is in turn coated with several layers of graphite, and a silicon carbide outer shell. While fission heats the pebbles to as much as 1,100°C, the coatings trap all radioactivity inside. Once the



Conventional Light Water Nuclear Reactor. The reactor core's uranium rods heat water which transfers the heat to the steam generator. The steam then drives a turbine to create electricity. Any problem with any of the three water pools (one in contact with the uranium, one in the steam vessel, and one in the coolant loop) can lead to meltdown.



Pebble Bed Modular Reactor: As many as 400,000 pebbles in the reactor's core heat helium gas (not water) which drives a turbine to create electricity. The helium is "conditioned" by a water cooler. But, even if the cooler fails or helium escapes, pebbles should prevent meltdown.

POPULAR SCIENCE. USED WITH PERMISSION.

fuel is spent, the coatings isolate radioactive decay particles for a million years—four times longer than it takes them to completely decay. Of course, they still need a permanent burial place.

With the pebble bed, a Three Mile Island-type event couldn't happen, Kadak says. Even if the helium coolant completely leaked out of the core, the fuel wouldn't get hotter than 1,600°C, well below the 3,000°C or so needed to melt uranium dioxide. Plus, the graphite coating is a great heat absorber.

A commercial pebble bed would produce 110 megawatts of electricity—one-tenth that of a large, light-water plant. Its core would consist of a giant, upside-down bottle, 3 1/2 meters in diameter and 8 meters high, filled with more than 400,000 pebbles. Pneumatic tubes would pull pebbles out of the spout at its base. They would be continuously scanned, put back in the top if still usable, and sent to a sealed container if spent. All of this would happen automatically.

Kadak's students weren't alone in their fascination with the pebble bed. A few months into the project, Kadak learned that a South African electric utility called Eskom was doing similar research. Before he knew it, Eskom and Exelon had partnered to create a next-generation nuclear reactor. The MIT team, meanwhile, has since

received more than \$1 million funding to investigate fuels, reactor core physics, safety, and waste issues. It hopes to build its own research reactor at the Idaho National Engineering & Environmental Laboratory in Idaho Falls. Eskom and Exelon plan to build a working prototype in South Africa by the middle of next year. Exelon itself has invested more than \$7 million and could submit a licensing application to the US Nuclear Regulatory Commission by next summer as well. If all goes smoothly—a big if, indeed—Exelon could have a commercial pebble reactor operating in the United States by 2006.

Along with safety and efficiency,

there is another major benefit to the pebble bed, one that could make it easier to bring to America: Adding 110 megawatts at a time to existing plants would stir up less opposition than building a new plant. And because the reactor would be built with replaceable modules, it would cost 30 percent less per megawatt. In fact, it's more accurate to talk about assembly than construction. "You could take the balance of the plant, put it on a flatbed truck, and ship it to the site," he says. "That's a true innovation."

It would also cost less to run. Continuous fuel cycling eliminates the need for refueling shutdowns, which happen every eighteen months

Thinking the Unthinkable

September 11, of course, had not been contemplated by the designers of any oil refinery, petrochemical plant, or thermal power plant. Accidents yes; kamikaze flights of commercial jets with full fuel tanks, no. I asked Dr. Kadak about pebble bed reactor security. At this point, he says, not much is known: can jet fuel find its way into the reactor vessel? to the pebble-fuel

itself? at what temperatures and other combustion conditions could burning jet fuel "melt" the graphite and silicon carbide protective layers of the pebble surrounding the uranium?

He notes that the "citadel" which houses the pebbles is much more robust than any coal- or gas-fired power plant or commercial building. But, pebble reactors do not

have the same crash shields required of light-water breeder reactors. No one knows if a 767 can break through any of these shields. Dr. Kadak feels that, as opposed to steam-based nuclear reactors, the radioactive pebbles should survive even if all the helium escapes, and should not trigger crises such as Chernobyl, Rancho Seco, or Three Mile Island.

—PW

at light-water plants. And the plant's gas turbines would be simpler and more efficient than the steam equipment used in conventional designs. So what? That means lower, more stable electric bills for you; a pebble bed could make power for well less than two cents per kilowatt-hour, versus four cents for gas-fired plant (90 percent of all currently proposed new plants use gas).

But there's a catch.

To meet those cost targets, Exelon will ask the government to license the technology without an emergency airtight containment dome used in light-water plants. That will prove controversial. "Opponents keep raising the issue of containment," Kadak says. "But if one particle in a fuel ball fails, the radiation released is minuscule." He admits that the fuel itself will need regulatory scrutiny, because the pebbles rely on their coatings for containment. And although there's no containment dome, the reactors themselves will be housed in a



Andrew Kadak challenged his MIT students to address global warming by developing a cheaper, simpler, safer nuclear reactor.

"citadel" strong enough to withstand the impact of a 747.

Exelon is more circumspect. Oliver Kingsley, chief nuclear officer, says the technology is far from a done deal. "It's a venture in the early exploratory stage," he says. "We're still doing design feasibility studies; we won't finish until this fall."

The pebble bed's fate also depends on that of the Price-Anderson Act, which limits a utility's liability for accidents. It expires next summer. Bush's energy proposal recommends its renewal, but if Congress declines, don't expect to see any new plants, let alone radically new designs. Also, the way

the act is written now, a 110-megawatt plant faces the same liability as a 1,100-megawatt facility. Exelon will lobby to change that.

Kingsley says his company will only go ahead with the project "if the technology is deemed ready for commercialization, and if the economics prove to be competitive against other forms of generation." In other words, though the pebble bed looks promising, and its technology sound, its ultimate fate awaits the outcome of a just-beginning political and scientific debate.

Nobody knows which way the winds will ultimately blow. But one thing's for sure. Two decades after nuclear died, burning itself to death on the banks of the Susquehanna River, it's trying to rise from its own ashes, like a mythical phoenix.

Excerpted with permission from "Nuclear Energy Comes Full Circle," by Charles Wardell, in *Popular Science*, August 2001.

The Cashflow/Energyflow Marriage

Taxpayers spend millions of dollars on nuclear power plant security. Despite security, almost half the simulated ground-penetration terrorist attacks on many domestic plants have been successful. In addition, taxpayers have spent over \$20 billion on nuclear power R&D (ten to thirty times more than on other fuels and hundreds of times more than on renewables). The largest subsidy for any private/public project in all of contemporary America has been for nuclear waste disposal. Congressional law also limits the nuclear power industry's liability in case of accidents.

Taxpayers, in effect, become the industry's insurers, bearing risks potentially greater than for either coal or gas because of the scale of potential harm from earthquakes, accidents, or sabotage. The costs of security, waste disposal, R&D, and insurance are huge policy issues for the nuclear industry.

A Level Playing Field?

Competition on a level playing field—no subsidies, or equal subsidies for solar, wind, and fuel cells—might hurt the future of nuclear power most. Is nuclear part of the free market? Is it a child of the welfare state fiscal policies? "Soft

path" energy advocates want life-cycle costing—from birth to death—of all power generators and their wastes. It is not clear that a 110-MW pebble bed reactor can economically compete on those terms with renewable energy or hydrogen-production alternatives.

Greenhouse Gases

Still, environmentalists must consider the advantages of nuclear power, which avoids most greenhouse emissions. If fossil-fuel plants replaced existing US nukes, they would add another 133 metric tons of carbon yearly.

The nuclear power industry says subsidies are

necessary to meet our treaty obligations. They argue that the cost of nuclear waste disposal and subsidies may turn out be cheap compared to the cost of reducing US greenhouse gas emissions.

Critics counter: Nuclear costs must be compared with those for renewables, especially wind and solar receiving equal subsidies. Critics also note that two-thirds of industrial CO₂ emissions come from transport vehicles and other sources, not from power generation. Electric car subsidies might be the least-cost greenhouse reducer. But who generates the electricity for the cars? —PW



Energy POWER MUSINGS

Unless we humans employ more energy, hundreds of millions more people will suffer from hunger, disease, and physical and mental discomfort. More energy for human welfare can come from many sources, but it must come.

The most contentious world energy source is redistribution from the industrialized nations. Our fear of redistribution stimulates new tech, fuels, efficiencies, and violent politics.

Oil has been praised and blamed as the kingpin in energy crises or cause of industrial advancements. Here are a few facts to perplex economists and ideologues. —PW

Biomass, Not Oil, Still Provides Millions With Energy

Nations where nine-tenths of the fuel used is fuelwood: Burundi, Central African Republic, Chad, Ivory Coast, Mali, Nepal, Rwanda, Somalia, and Tanzania.

Half of the fuel is fuelwood: Bangladesh, Belize, Bhutan, Burkina Fosa, Cambodia, Cameroon, CAR, El Salvador, Equatorial Guinea, Ethiopia, Gambia, Guinea, Guatemala, Haiti, Ivory Coast, Kenya, Laos, Liberia, Madagascar, Malawi, Mauritius, Mozambique, Myanmar, Nicaragua, Niger, Nigeria, Papua New Guinea, Paraguay, Senegal, Sierra Leone, Solomon Islands, Sri Lanka,

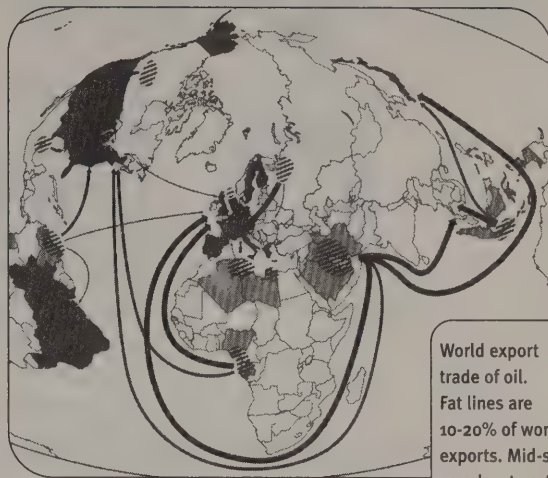
Sudan, Tanzania, Uganda, Vietnam.

Half of the regional fuel supply in some regions is fuelwood: Brazil, India, Pakistan, and Tunisia.

Energy Consumption

Highest energy use has a lot to do with tiny sheikdoms and very cold climates. **Highest energy use per person:** Qatar (839 gigajoules); United Arab Emirates (487); Canada (437); Brunei (434); Norway (419).

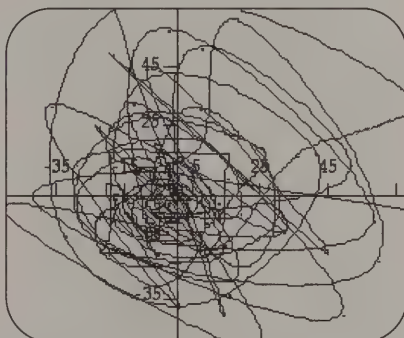
Lowest energy use per person has to do with a poor resource base, isolation, and poverty. Comoros (2 gigajoules); Bangladesh, Cape Verde, Togo (3); Ghana, Guinea-Bissau (6).



World export trade of oil. Fat lines are 10-20% of world exports. Mid-size equals 5 to 10%. FROM UNCTAD, 1995.

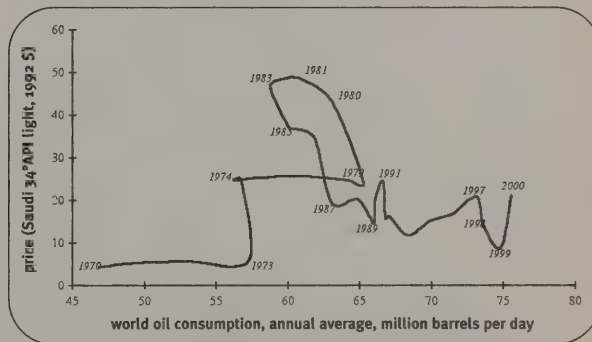
Good-bye Mideast Oil?

The US imports 56 percent of its oil, but only 13 percent comes from the Persian Gulf. (Persian Gulf oil is more crucial to Europe.) The rest comes from Mexico, Canada, the North Sea, Indonesia, Venezuela, and a few other places. The most likely future sources: the Former Soviet Union nations. Conservation, more coal, and alternative energies could eliminate imports from the Persian Gulf.



Oil Price Changes: 1881-1993

Graph shows price change per year. Long-term oil price changes have no trend. All that happened after 1973 is that the volatility (the size of the swings) tripled, but changes stayed perfectly random.



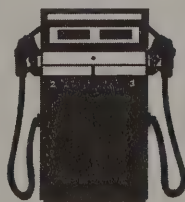
EXPORT

- Ten top exporters of oil, gas, and coal:
- Former Soviet Union (11,453)*
 - Saudi Arabia (8,805)
 - Mexico (6,150)
 - Iraq (5,034)*
 - Canada (3,295)
 - Venezuela (3,209)
 - UAE (3,189)
 - Norway (3,124)
 - Iran (3,029)
 - Algeria (2,843)

IMPORT

- Top ten importers of oil, gas, and coal:
- Japan (13,198 thousand tetrajoules)
 - USA (12,854)
 - Germany (6,860)
 - Italy (4,773)
 - France (4,349)
 - S. Korea (2,281)
 - Spain (2,125)
 - Brazil (1,544)
 - Belgium (1,543)
 - Bulgaria (1,086)

*Before Soviet split and Iraq embargo (1991)



Supply, Demand, and Price Trends

Trends? World crude oil prices have not risen with "free market" supply and demand, confounding all the prophets of doom or boom. Even consumption has not risen in any trends that can be tracked by formulas. Note the odd loop from 1979 to 1986: prices climbed and crashed while consumption remained relatively constant.

MOST FACTS FROM: MICHAEL KIDRON AND RONALD SEGAL, *THE NEW STATE OF THE WORLD ATLAS*, (SIMON & SCHUSTER, 1991)



Hydrogen

— a little PR

by **Thammy Evans and Peter Light**

You've probably heard something about hydrogen. On the positive side, the PR says hydrogen is the ideal fuel for cars, homes, and even your laptop or cellphone. In fact, all the major car companies are intensely researching hydrogen technology for the next generation of vehicles, and the US Department of Energy is sponsoring research into hydrogen-powered fuel cells. With global climate change and our dependence on foreign oil, the potential zero-emission hydrogen economy appears a great hope.

On the negative side though, isn't hydrogen too dangerous? too difficult to handle? too expensive? And doesn't producing hydrogen require emissions of greenhouse gases that equal gasoline?

To start, hydrogen is not a rare chemical dreamed up by alchemists and used by H-bomb scientists. In fact, hydrogen is the simplest and most abundant element in the universe, most commonly found on Earth as H₂O—water. Our bodies are primarily hydrogen. Under typical

conditions, hydrogen is a colorless, odorless, tasteless, and nonpoisonous gas. It is the lightest gas known on the planet. In fact, the lightest substance known. Hydrogen remains un-reactive except when sparked by a catalyst or high temperature. So even though it is handled much like natural gas, it is not harmful to breathe if it leaks.

Pound for pound, hydrogen contains three times more energy than gasoline—one of the reasons why it's a superior fuel. But hydrogen is also much less dense than gasoline. So to have enough fuel to travel the expected range of 300 miles or more, the hydrogen gas must be compressed, or liquified, and stored in high-pressure tanks. In order to remain in a liquid state, hydrogen must be kept at minus-423 degrees Fahrenheit.

The Hyper-Isolated Tank

Because hydrogen is so light, a hydrogen-fueled stationary vehicle, merely sitting in the sun, could let off fuel. It's not the tell-tale odor of gas fumes at the station but the odorless escape while refueling that worries carmakers. BMW's fully automated filling system and their revolutionary "hyper-isolated" holding tank have greatly reduced the problems of evaporation losses. With a new robot-

ic process, refueling time has been cut to less than three minutes and hydrogen loss has been eliminated.

The hyper-isolated tank does not require an additional energy source to remain cool, although after a couple of weeks the temperature of the tank does gradually increase. As the tank warms, hydrogen begins to evaporate away at about 0.8 percent of the tank's current level per day.

Producing Carbon-free Hydrogen

The biggest barrier to the hydrogen economy is producing hydrogen in a pure state. To extract pure hydrogen that is bound up in molecules takes energy. Among the methods are dropping metals into acid, splitting the "H" from the "O" in water by electrolysis, steaming hydrocarbons such as oil or natural gas, and decomposing other hydrocarbons such as coal with high temperatures. Which method to choose and use to produce hydrogen will determine how pollution-free and cheap the complete life cycle of the hydrogen economy (from production to emissions) will be. In fact, using fossil-fuel-derived power to produce electricity to produce hydrogen for your fuel cell car may afford little greenhouse gas savings compared to dri-

Thammy Evans is assistant director of transportation solutions at the Rocky Mountain Institute (www.rmi.org). Peter Light is an intern in RMI's communications department. This article is excerpted from their longer RMI paper, "Hydrogen—the Ultimate Clean Fuel of the Future."

ving a traditional gasoline car.

BMW's supplier of liquid hydrogen fuel is a German company named Linde, whose Ingolstadt plant is a primary producer for Europe. Highly environmentally conscious, Linde's production process is non-polluting. Linde utilizes photovoltaic (PV) cells to convert the energy that sunlight provides into direct-current electricity. Via a process known as electrolysis, the electric current is run through water to split it into its component gases of hydrogen and oxygen. (You might have seen this in a high-school chemistry experiment.)

Other renewable energies such as wind power or hydro would ensure a much cleaner production of hydrogen than using traditional sources of electricity from coal or nuclear power. But hydrocarbon advocates have not given up. Alternative means of producing hydrogen from natural gas, methane, and coal are under way.

The US hydrogen industry already re-forms 5 percent of our natural gas into hydrogen for the space and petrochemical industry. The largest production of hydrogen is for ammonia-based fertilizers and explosives. The steam-methane method which combines water and natural gas at high heat produces hydrogen at 75-percent efficiency.

The trick in re-forming hydrogen from natural gas without emitting any carbon dioxide, however, is to sequester the CO₂ by binding it with minerals or, when possible, pumping it back into natural gas wells. Pumping would have the advantage of pushing up more natural gas, but the technique is not yet a reality.

In short, the grandiose transformation to a hydrogen-based economy is daunting. The space required to produce enough hydrogen for the world to abandon carbon-based fuels and nuclear is not here. With limited rivers for hydro and locales for wind power, PVs remain the best opportunity for clean hydrogen.

Is It Safe?

Like any fuel, hydrogen stores significant amounts of energy, and handling it requires certain safety precautions. The Department of Energy (DOE), Natural Resources Canada, and NEDO (Engineering Advancement Association of Japan) maintain that hydrogen can be safer than gasoline if it is used properly, in part due to the stricter safety standards around hydrogen than around volatile gasoline.

Some fear that a hydrogen tank has the potential to explode—which is possible—but such critics often overlook the equally explosive potential of the gas tanks in their very own cars. Many real-life tests have demonstrated just how safe pressurized storage can be, and cylinders are subject to certification by authorities such as the US Dept of Transportation (DOT), the American Gas Association, and the American National Standards Institute. Simulated 55-mph crash tests by the DOE on a hydrogen vehicle left the car badly damaged, but the hydrogen tank intact. To prove the safety of its hydrogen vehicles, BMW tested its hydrogen tanks in a series of accident simulations that included collision, fire, and tank ruptures. In all cases, the hydrogen cars fared as well as conventional gasoline vehicles.

What if the hydrogen was to somehow ignite in a car? Tests conducted at the College of Engineering at Miami University leaked 3,000 cubic feet per minute of hydrogen from a vehicle tank and set it alight.

Over the course of the burn, temperature sensors inside the vehicle did not measure a rise of more than 3 or 4 degrees Fahrenheit anywhere inside the vehicle. The temperature of the surface of the outside of the vehicle did not exceed that of a vehicle sitting in the sunshine!

This might sound counter-intuitive. But when a carbon-based fuel like gasoline burns, glowing hot soot particles transfer the heat to its surroundings, potentially including you. Because hydrogen contains no carbon, it burns cleanly without a residue of hot soot, producing little radiant energy. This means that a victim would have to be in the flame in order to get burned. During the greatest "experiment," the Hindenburg explosion, no one died of burns from hydrogen.

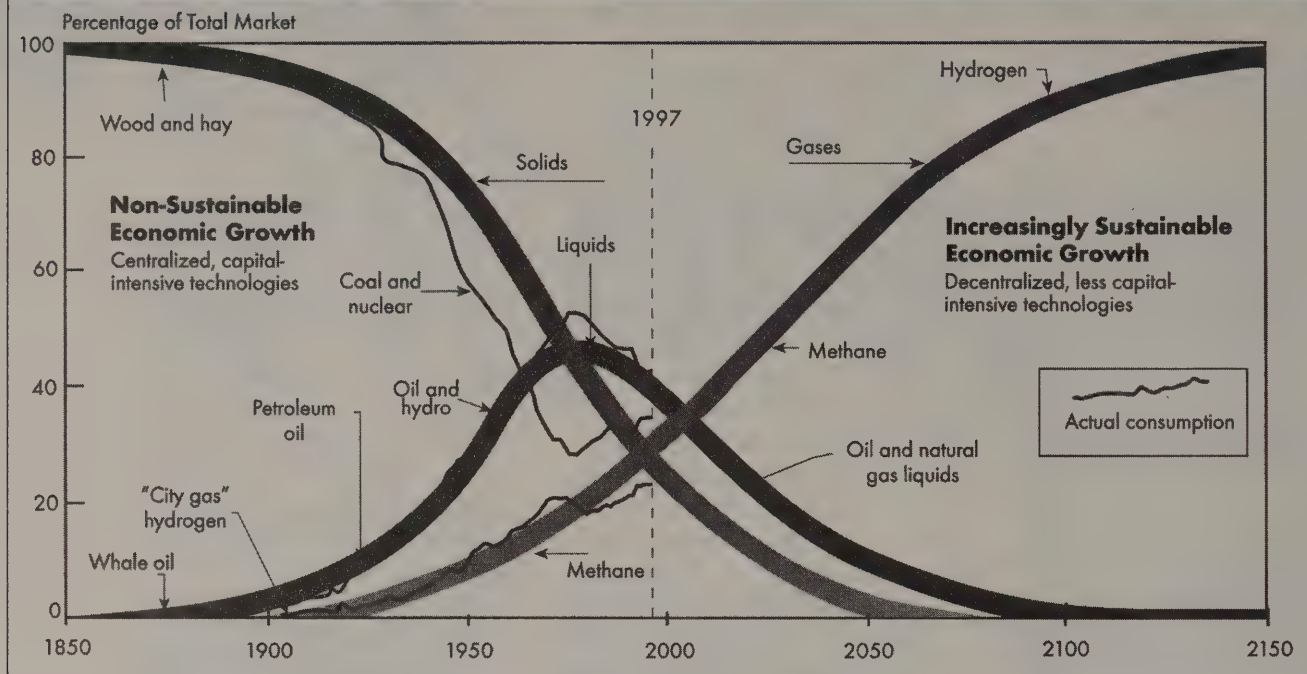
As hydrogen gas is much lighter than air, it disperses and floats skyward when leaked—it won't pool or soak into clothing just waiting to ignite, like gasoline. Spilled hydrogen won't permeate the earth and pollute ground water either. Environmental disasters like *Exxon Valdez* will be unknown in a hydrogen economy.

Let's celebrate. There are no major drawbacks to a hydrogen future. Iceland, with hydrogen produced by geothermal power, wants to be the first nation to go "hydrogen." It could occur in less than a decade.

The 1937 Hindenburg Disaster

The massive explosion occurred not because of hydrogen, but because the coating of the airship was treated with aluminum powder, cellulose acetate and iron oxide. (Unbeknownst at the time these are the basic ingredients of rocket propellant!) While the airship was docking after its transatlantic flight, the coating ignited. An electrical discharge from nearby storm clouds hit the ship. The hydrogen gas filled the zeppelin and did burn, but did not contribute to any deaths. The clean hydrogen flames swirled above the occupants of the passenger compartment, helping "float" the zeppelin gently down to earth. All those who rode the airship down to earth survived. Thirty-five of the thirty-seven casualties who perished did so because they jumped to the ground; most injuries resulted from diesel burns.

Global Energy Transition, 1850-2150



FROM *HYDROGEN FUTURES* (SEE PAGE 47).

Hydrogen Energy

The Upside

- H_2 is a complete substitute for nearly all fuels.
- H_2 is safer than gasoline.
- H_2 can be produced from a wide variety of renewable sources, indefinitely.
- With H_2 , the last technological pieces for a world-wide solar economy are coming into place. Solar and wind-electrolyzed H_2 provides a storage medium for renewable energy as well as a totally renewable fuel.
- The cost of renewable H_2 will initially be somewhat higher than gasoline, but with normal technological advances and economies of mass production it should quickly come down to easily affordable levels, where it will stay for decades.
- The shift to a renewable hydrogen economy will halt further increase in global warming from greenhouse effect.
- The hydrogen fuel cell is twice as efficient as today's internal combustion engines.
- Relatively little commercially valuable land will be required to produce vast amounts of renewable hydrogen. Wind turbines fit compatibly onto agricultural and grazing land, while large solar arrays prefer dry deserts.

The Downside

- Safety precautions required for handling H_2 are different from those required for gasoline and natural gas. New safety training and education will be necessary.
- The hydrogen electrolyzer, a long-lived fuel cell, and fuel-tank technology are not fully developed.
- Liquid hydrogen is expensive and awkward. Compressed H_2 at less than 8,000 psi will be bulky. The carbon nanotube and metal hydride alternatives are not fully ready.
- There is no consensus at the moment on the most cost-effective strategies for hydrogen refueling.
- Fossil fuel companies want to be major players in a hydrogen economy tilting production modes toward fossil-fuel feedstocks for H_2 —convincing car companies to design small reformers to make H_2 from gasoline or methanol onboard the car itself.
- When fossil fuels are used as feedstock for H_2 production, the carbon in them is released as CO_2 , unless the carbon is captured and sequestered. (When H_2 is produced from water by electrolysis, no CO_2 is produced.)

—Ty Cashman

Tomorrow's Energy

Small whispers of hydrogen energy's vast potential have been heard along the fringes of industry since the oil shocks of the 1970s, but only last year did a steady drumbeat begin in the capital markets of Wall Street, Europe, and Asia. First BMW and Daimler-Chrysler, and then Ford, Honda, Toyota, GM, and others laid claim to hydrogen fuel and to the fuel cell as a new prime mover for the automobile.

An informed public may be all that is required to bring an end to the climate-destabilizing fossil era. Until this summer, though, we had no recent book on the emerging world hydrogen economy. Information was available only to readers of periodicals like Peter Hoffmann's Hydrogen and Fuel Cell Letter and The International Journal of Hydrogen Energy.

Finally in August, two books. Hoffmann's chronicles hydrogen science and technology from the earliest days. Embedded in its historical narrative are explanations of these technologies and their advantages and drawbacks. He addresses the questions people are starting to ask: Why a hydrogen economy? How do you get hydrogen? What will it cost? Is it safe? Will it reduce global warming? What is its connection with solar and wind energy? The book's main drawback is the index, which is missing essential entries such as pipelines, carbon dioxide, leakage, sequestration, biomass, and embrittlement. But at last we now have a book we can use to understand the elements of this epic change.

Seth Dunn's Worldwatch Paper speaks from the environmental perspective and describes present practices with an eye to the future. He reports on a range of studies by government agencies, NGOs, universities, and corporations, all attempting to illuminate potential paths for the emerging hydrogen economy. He compares this moment in the hydrogen fuel revolution to the early automobile era, which saw fierce competition among technologies before the gasoline-powered internal combustion engine won out as the standard. —Ty Cashman

“Decarbonization is just what it sounds like: taking the carbon out of hydrocarbon fuels. What is left is, of course, hydrogen. Decarbonization will be the industrial end-game strategy of a trend first detected by Cesare Marchetti in the 1970s, when he described a gradual shift, over centuries, from hydrocarbon fuels with high carbon and low hydrogen content (wood, peat, coal) to fuels with increasingly less carbon and more hydrogen (oil, natural gas), culminating, seemingly inevitably, in pure hydrogen as the principal energy carrier of an advanced industrial society.

“If hydrogen is ever to replace natural gas as a utility fuel, very large quantities obviously will have to be stored somewhere. Storage, to maintain a buffer for seasonal, daily, and hourly swings in demand, is essential with any system for the transmission of a gas. Storage facilities even out the ups and downs of demand, including temporary interruptions and breakdowns, and still permit steady, maximum-efficiency production. —TOMORROW'S ENERGY

“It has been suggested that huge amounts of hydrogen could be stored underground in exhausted natural gas fields, in natural or man-made caverns, or in aquifers....The natural gas industry has long been using depleted gas and oil fields to store huge amounts of natural gas. Aquifers are similar to natural gas and oil fields in that they are porous geological formations, but without the fossil-fuel or natural gas content. Many of them feature a “caprock” formation, a layer on top of the formation that is usually saturated with water. This layer acts as a seal to keep the gas from leaking out; it works for both natural gas and the lighter hydrogen.

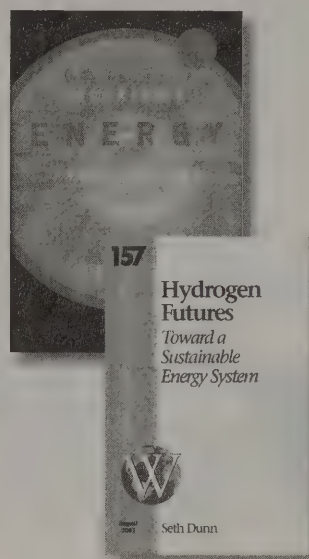
—TOMORROW'S ENERGY

“One of the most significant obstacles to realizing the full promise of hydrogen is the prevailing perception that a full-fledged hydrogen infrastructure—the system for producing, storing, and delivering the gas—would immediately cost hundreds of billions of dollars to build, far more than a system based on liquid fuels such as gasoline or methanol. As a result, auto and energy companies are investing millions of dollars in the development of reformer and vehicle technologies that would derive and use hydrogen from these liquids, keeping the current petroleum-based infrastructure intact.

This incremental path—continuing to rely on

the dirtier, less secure fossil fuels as a bridge to the new energy system—represents a costly wrong turn, both financially and environmentally.

—HYDROGEN FUTURES



Tomorrow's Energy Hydrogen, Fuel Cells, and the Prospects for a Cleaner Planet

Peter Hoffmann

2001; 289 pp.

\$32.95

MIT Press

Hydrogen Futures (Worldwatch Paper # 157)

Toward a Sustainable Energy System

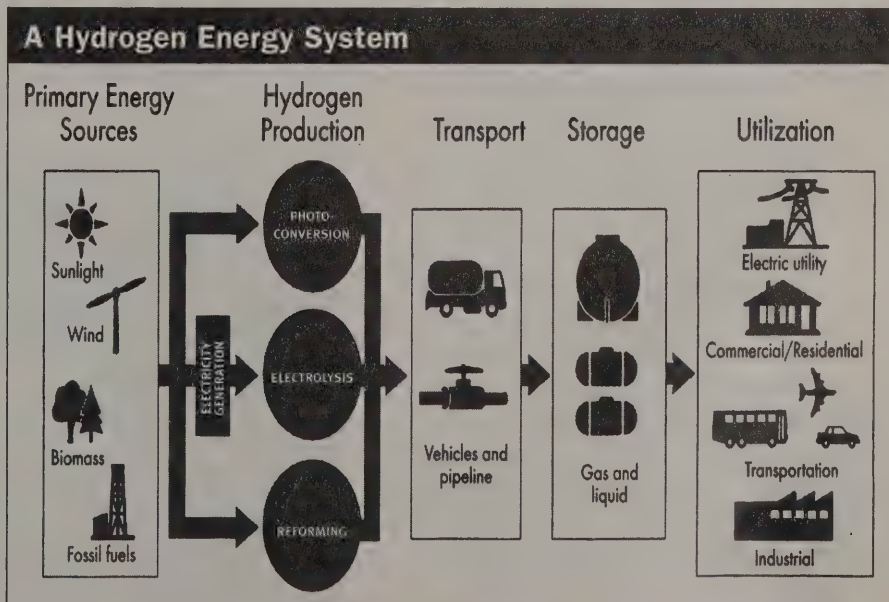
Seth Dunn

2001; 90 pp.

\$5 downloadable or by mail (\$9 postpaid)

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www.worldwatch.org



FROM HYDROGEN FUTURES



IN HIS VEHICLE—
PART VW BUG,
PART TABLE—
REUBEN MARGOLIN
NAVIGATES A
CROSS-COUNTRY
TRAVELING COMMONS.

Excerpts from Reuben Margolin's newsletter.

MARK LUTHRINGER

THE TABLE OF CONTENTS

SEPTEMBER/OCTOBER, 1993

Above: Reuben's table car. The windshield folds into the driver's seat pit. A flat wood slab flips over the driver pit to complete the table. Fenders become seats for convivial conversation.

Several years ago I found that cramming a large table into a small room greatly increased the size of the room. The table invited conversation, ideas, and laughter much more easily than I did. It was a Wednesday in September of 1991 when friends and I first wrestled a wooden spool top up the stairs, oblivious in our excitement to its splinters and rusted nails. By nightfall we had calmed it with offerings of spilled candle wax and red wine. By ten there had begun what came to be known as the Utopia Round Table Meetings.

These meetings, more or less centered on figuring out what the idea of utopia was all about, were the best discussions I ever had at Harvard. They would begin tenish every Wednesday and last to the wee hours of the morning. We were not beyond including course material or reading out loud from books, nor were we beyond moaning about relationships gone sour, or abandoning words altogether to play chess.

The conversations were intense and spectacular, charged with the unspoken understanding that the round-table meetings themselves were a kind of utopia. Every week we tossed around notions of community and tradition, stability and sterility, free will and free love. Toward the end of the year the meetings felt as if they were rolling toward some kind of climax. Very late one night, with the sun just peeking through the Boston skyscrapers, we put all differences aside and promised to meet in Baja (why Baja, I don't know) after we had graduated. Amid daring speeches and solemn oaths we signed our names on the wall committing ourselves to launching the real thing—the real Utopia—no matter who we became in the between years.

The following Wednesday nobody showed up. A week later, the table disappeared into the basement, where it soon became moldy from a water leak. It took a month before we could look at each other in the eye and the notion became, unanimously and without deliberation, a topic of taboo.

But the idea of a round table, where no seat is privileged, and all

eyes look through the same pocket of air, has continued its hold on me. After years of carrying the notion with me through travels and co-ops, I now find myself literally carried by the idea. A community around a table is—in many ways—the real thing, not just the launching pad.

I have now begun building a traveling commons—an eight-foot round redwood table atop four wheels and a car engine. I, and whoever else ends up joining me, will drive the table around the world. Talking, cooking, writing, sculpting, playing billiards... the table escapes narrow definition of purpose.

It will be a drama in which many people, with all their stories and concerns, thoughts and passions, will be the actors, the landscapes, the backdrops. It will be a community based on what people have to give—and there is everything to give. Some may offer food, wine, and a place to park; others, content and inspiration. The traveling commons is the stone in stone soup, the sand in the oyster. It is a magic carpet that flies—not above people, but through and within them.

There will be a library, dictionary, typewriters, cameras, easels, and elegant china stored in compartments below deck. We will stop at universities, parks, capitols, housing developments, and sometimes even red lights—the traveling commons transcends class and country. We might stay in a place for weeks, or just a couple of minutes. As we gain recognition, and take on the momentum (wobble?) of a pottery wheel, we will sometimes write ahead, inviting artists, writers, and thinkers for a meal and a chat. Over the engine, using the heat of combustion, we will bake bread and make coffee. We may also have a zucchini or two growing in a well in the center of the table.

NOVEMBER/DECEMBER 1993

Deep in the marrow of West Oakland, in the industrial desert of the abandoned Phoenix Iron Works, under the derelict scaffolding of warship craze and the flapping of pigeons and the falling

Above and right: Reuben and suckered friends strip down a VW Bug and level its body to transform it into the car table.



REUBEN MARGOLIN



REUBEN MARGOLIN

of feathers, in inches of soot and clouds of green gasses, lit by shafts of light piercing dusted air from a thousand windows vibrant red from the setting west, among miles of steel and acres of concrete, the table seems simple, small, insignificant. In this gloom of forgotten machinery, under wires which haven't breathed electricity in years, there's the sense—not so much that beauty will one day be guest to the table—but that the table is already guest to great beauty.

When the door to the central bay (100 feet wide, 150 feet high, 600 feet long) stopped creaking upward, and my eyes had adjusted to the gloom, I could barely make out two abandoned VW Bugs tucked into a mountain of garbage. They were listing at crazy angles with smashed-in windows and fenders all dented, but the essentials were all there: the motor, wheels, and floor plan. I looked around me. If people could

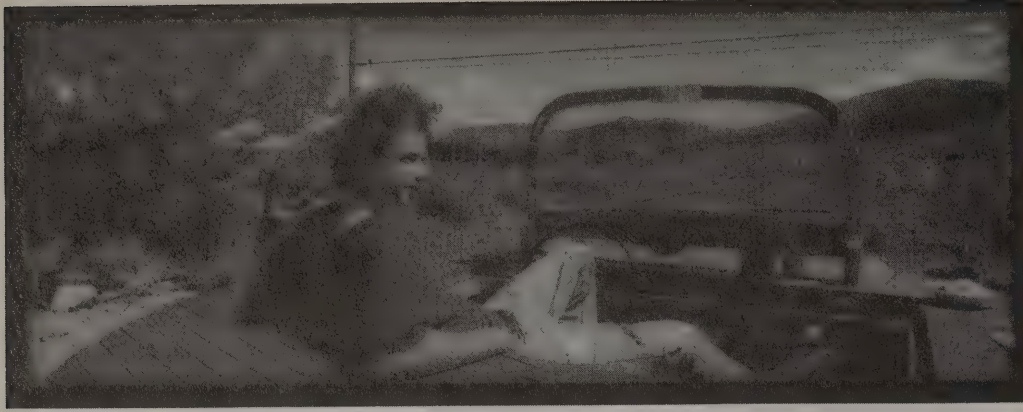
enclose such a vast expanse, and make the overhead crane capable of lifting a hundred VWs, surely I could modify a Bug.

Friends helped strip windows, fenders, bumpers, doors, hood, trunk, seats, and running boards from the car. In our enthusiasm we pulled out all the wiring, only realizing afterwards that some of the wires were probably important. From the mountain of trash, we recovered three ignition wires and the oil and generator lights. Then using an air grinder, Sawzall, tin snips, can opener, and finally a corkscrew, we cut the top off the car. Now only 33 inches tall, the VW was the right height for a table base, but at 12 feet long, it threatened the roundness of the table. So in a moment of brash confidence (“we’ll just spend a few hours welding this thing back together”), we chopped the car in half and threw away the middle four feet. Now we had a big problem. The car was in two pieces, and no one knew how to weld.

When we ran out of thoughts we turned the ratchet from loosen to tighten and bolted the car together. With a mig welder borrowed from Phoenix we tried to make the two halves stick. After struggling for hours, experimenting with voltage and wire speed, we finally showed Weldon, a third-generation ironworker, our progress. After several moments of silence, staring at our atrocious splatter of weld, he said, “Well, I hope you’re at least having fun.”

JANUARY/FEBRUARY 1994

Dealing with strangers first became a problem on a particular Wednesday lunch at the Phoenix Iron Works, a month before our departure. Despite people’s interest, I found myself getting grouchy. An



MARK LUTHRINGER

Reuben and the table car in Tucson. The driver's wheel must be unscrewed and removed to accommodate the fold-down window.

enthusiastic stranger who walked in off the streets managed to ask the same exact questions I had already answered twice that day. "Wow," he said staring at the table, "Where did you get the idea?" A button pressed inside my head and I launched into spiel #1. When I reached the end of my recording, I beeped and he asked, as if on cue, "What are you going to do when it rains?" Without hesitation, I returned, "Get wet," and prepared for the next assault. Before he had even finished asking: "How are you going to get across the oceans?" I was screaming dementedly, "Take a boat! Take a boat!"

Gradually the problem became clearer—the only thing talked about around the table was the table. Instead of being a catalyst for conversation, the table was the sole topic of conversation. Somehow it had gone from being the pot for stone soup to the soup itself.

The problem became acute when an unknown man fingering a Bowie knife wanted to carve his initials into the just-sanded maple top. The question became one of limits—to what extent is the commons common property? Can someone rip off a hunk of table for firewood? And more importantly, do I reserve the right to direct conversation to things that interest me?

I finally found the solution the night I finished the table. It was now pitch

black. Leaving the commons behind, I kick-started my motorcycle, and rode toward the sliding door of the warehouse. When it opened the horizon of the whole world seemed to lift. Suddenly I was overcome with a desire to ride as fast as possible. At 95 mph a critical speed is reached. Under that, everybody you pass thinks "What a jerk, I hope he kills himself," but over 95 people see you fly by, and without meaning to at all, they step on the gas. It's like you've inspired the race in them. That night every car behind me moved faster than before.

Instead of inspiring people to greater speed, I want everyone the table passes to start going slower, thinking harder, laughing louder. Instead of people looking at me and thinking "What a mad man," I want to be so totally mad that without meaning to they start acting strange themselves. If people are looking at the table and wondering, "What does he do when it rains?" I clearly haven't reached critical speed yet. So I'm winding up the throttle more. I want people merely to hear the table coming and start shaking hands and giving fantastic introductions. I want people just to see the table from afar and start scribbling poetry on scraps of guttered paper. And by the time the table arrives, I want there to be so much raw energy that the table is hardly noticed at all.

That's what I'm trying to build. I don't know where the critical speed is that inspires such madness and communion, and life, really, but I know the table just might find it. And when that

critical level of intensity is reached, there will be conversations, sculptures, readings, and parties like never before.

MARCH/APRIL 1994

Less than a month on the road, on a hot day in late February, the grungy banditos nervously approached the inspection station at the Arizona border. They were driving a table. They were about to get busted.

Having spent the last week crossing the Mojave, Scott, my friend and copilot for the first thousand miles, and I were grungier than usual, and the table looked down right impossible to have a respectable conversation around. The left rear tire had lost half its air and the land-boat listed dangerously. The windshield had long since fallen out, somewhere, I think, between Barstow and Bakersfield. Although we'd duct taped the windshield frame back together, we'd jammed the wiper switch on, so that the blue wipers waved incessantly in empty space. Such quantities of chili beans, bacon grease, and wine had spilled on the table that, as we slowed down to be inspected, a great swarm of flies descended upon us. I peered through the bugs splattered on my safety glasses at the fine specimen of authority blocking our way. We had been stopped several times already and I was wondering how in the world were we going to convince him that the table, despite appearances, was a socially responsible invention designed to foster a utopian sense of community.

As it turned out, the officer had altogether different concerns: "What happened to your windshield?"

"It fell off."

"What about your license plates?"

"They fell off too."

"Do you have registration and insurance?"

"Well not exactly, but..."

"Where is the Vehicle Identification Number?"

"Well, in the modifying of the car I cut it out and lost it." A change came

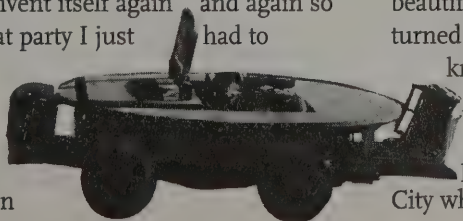
over the officer. He got very excited. "Don't you know," he yelled, "you're not allowed to move the VIN! That's a Class Five felony!"

"Oh."

"I'm sorry boys, but this vehicle is contraband. I've got no choice but to impound it." Without the VIN I have no way of knowing whether it's stolen or not." Then his eyes narrowed, "Say why are you trying to leave California anyway?"

"Well you see, Officer, the truth of the matter is I had this going-away party, and it was such a great party I just had to leave afterwards." With one big breath I continued, "It was in the Phoenix Iron Works warehouse and hundreds of people came and whole motorcycle gangs rode through the darkness toward the bonfire which raged 40 feet high 'cause Jenny kept throwing on whole pallets and the concrete floor was exploding from the heat but Eric kept on barbecuing fifty chickens and tapping Bison Brew and people gave away cigarettes and motorcycles and secrets which you couldn't hear because the musicians who were lit by red stage lights and looked a mile away blasted notes till morning and Steven jumped off the bus and hung upside-down on the rope swing to fly right through the flames emerging again to applause looking rather singed and two shades darker but grinning nonetheless like he might have seen something in the fire and then Big Dave heaved the top of the VW Bug over his head like the skin of a fierce animal and danced while Kate sang to the flickering shadows of the steel girders with her legs swinging from the speakers and poets sat around the table typing messages full of spirit and mystery such as 'xjbacl qroty spark' and what I'm getting at, Officer, is that I love my friends but that the table strives to overcome itself and reinvent itself again and again so after that party I just had to leave."

The policeman had been



growing paler and paler. When I finished he looked like he wished he'd never stopped us.

"Maybe," he cleared his throat. "I could allow you return to California."

"Yes, Officer, yes sir."

However, when the CHP officer arrived to escort the table back, he took one look at us through his Terminator II sunglasses and said, "California doesn't want you." But Arizona wasn't about to give up. "I am definitely," he said, "not allowing them in our state." After a good deal of negotiating (it's amazing what the table's been used for), we were ordered to return to Blythe, California. We were sweaty and tired and pissed off.

Blythe looked a god-awful city. We pulled off at a dusty turnout behind some dilapidated trucks. Tex, a skinny Oklahoman, pulled himself out of an engine and sauntered over. "Wow," he said, "nice rig! What is it—a Jacuzzi on wheels? Ha ha. No, I really like it. It's different. You make it?" Like most people we met (authorities aside), Tex became all grins when checking out the table. His enthusiasm picked us right up. "Yeah man!" We were grinning too, "It's the Traveling Commons. We're seceding from the Union. Ha ha. But first we're gonna cook up a storm—you hungry?"

"Yeah, sure. One sec." Tex returned wearing a white dress shirt, carrying a Patsy Cline tape. He sat down on our folding chair, rolled a Bugler cigarette, and watched Scott slice steak and mushrooms. (The table serves only the finest of foods.) Tex said he'd just left his wife 'cause "it was like that Hank Williams song: *If she ain't gonna change, I'm a-gonna leave.*" But he missed his yellow Lab, who used to split a case of Coors with him. Together they would howl at the moon.

"Once," he said, "I saw the most beautiful woman in the world. But she turned out to be a sister I didn't even know I had."

I drifted off. The table had seen so many strange and sad people. There was a man in King City who had just stolen his grandma's

'57 Chevy Impala to transport a harvest of dope, but first he had to stop by court to plead guilty to biting his wife. Then we spent a night talking to Victor, a shy Peruvian shepherd, whose land we camped on near Lost Hills. He told us that the black sheep always leads the pack because it walks faster, and that Orion's belt is really called the *Tres Marias*. In Rosedale we were surrounded by junior high delinquents who kept disappearing to "yank" packs of Marlboros. In Twenty-nine Palms we met a Mexican jail runner who lived on earnings from cockroach races. T-bird, his favorite roach, never lost when beans and tortillas were at stake.

The grungy banditos had to escape Blythe, but they were afraid of getting pulled over on the way out of town. They had no itinerary other than to make it to Tucson, Arizona where their friends were. Then they got an idea. If they weren't allowed to drive on the roads, they'd drive off them.

At three in the morning we steered the table over sidewalks, hedges, lawns and lots to the outskirts of Blythe. Then, putting garbage bags on to protect against the cold, we struck out over the sand. For fear of being spotted we left the headlights off, and it was near impossible to see. We hit one bump that was so big we flew clean off the table and had to chase it through the desert. We drove and drove, floated across the Colorado (yes, the table floats), and before long were completely lost. When we finally dragged ourselves back to I-10, we had no idea which side of the border we were on. But we guessed correctly, and turning lights on, stopping only for gas, drove east.

The ride was exhausting. For hours the table lay around our middles like a perverse guillotine awaiting impact. At





REUBEN MARGOLIN

interstate speeds, wind dove into the cockpit throwing sawdust and trash into our faces. At 55 mph the front lifts off the ground as the table planes into a wheelie. Without front traction there is no steering and the turbulent weight behind each passing truck lifts the table up, shakes it around and drops it. The worst, though, is that in the heat of the day the sun bounces off the deck and focuses on our heads like a solar oven.

We finally made it to Tucson, where we collapsed into the safety of our friend Grace's home. Grace, a graduate student of poetry, quickly got us into shape. Within a few hours we had showered (Ivory and Pert), washed laundry (Tide), eaten some veggies (lettuce) brushed our teeth (Crest), organized a poetry reading at the U of A (where squeaky clean students were to gawk at the table) and had the Transportation Department come over to inspect the table. There are the same old problems which are now starting to wear more on my sanity. Case of the missing VIN, concerns about safety. A truck that carries ideas, no gross weight, no idea too gross? A dune buggy for the rugged landscape of the mind? The inspector took a Polaroid picture and gave it to his supervisor, who sent it to headquarters in Phoenix, who sent it to their rep at the Attorney General's office. A long chain of stalling, deferring officials. Hurry up guys, take a stand.

Let me muddle through some thoughts which seem permanent, if uninvited, guests at the table. When I look at the Traveling Commons I no longer see a round table pregnant

with potential; I see a flat-bedded hearse carrying an idea that has expired. The table is, among other things, a work of art, and driving it around makes me feel like a painter who has finished a painting and then gone and climbed into the canvas. It seems to me that a person who dreams up a rolling table is very different from the person who'd care to display it on the road. But surely, you might say, the table isn't just a sculpture to be displayed. It is supposed to create a sense of community blah blah blah. Well it does, but I prefer the community which surrounds creation to the community made of the growth-stopping applause of a work completed.

Though the table makes a hundred people smile a day, I find that I am not willing to inspire others at the expense of my soul. How can making people happy and organizing dinners damage anyone's soul? It's like this: because the table makes a hundred people smile a day, I, Reuben, have no reason to rise to the occasion. So I don't. Even if I pick my nose, wear smelly shirts, sulk in underground spite, and have no creative ideas to speak of, people will still like that stupid bucket on wheels. The success of the table has made me a dulled steward. I am waiting for someone to look at the Traveling Commons and say "Wow, nice coffin!" I need a break.

By now I am searching for a way to rid myself of the table forever. It took me a week to get to the northern deserts of Chihuahua, Mexico. I spent the last of my money on a fabulous feast for seven: shark and lamb; caviar and olives; garlic, ginger and cilantro; French wine and fresh bread. Leaving the market behind I drove an hour due east into the

middle of nowhere. There was neither road nor house, only a saguaro here, a barrel cactus there, a lot of sand underfoot, and even more sun overhead. It was very hot and I began chopping garlic. I cooked for three days straight, not eating or drinking, waiting to see who would come to the feast. Late in the third day I spread out a frayed white cloth over the table. A slight breeze rippled through the fabric like the echoes of a splash. On the cloth I set porcelain bowls and dished out the first course. Steamy aromas rose in spirals into the dry air. I laid out seven silver forks and seven folded napkins. I uncorked the cabernet sauvignon and poured it into crystal glasses. Then, as I was about to take my seat, (it's hard for me to tell if this has happened or not), I realized I wasn't invited—the meal was for the sand, the stars, the cactus and the wind. Without looking back I walked away toward Chihuahua, leaving the table to the elements and the gods; leaving the Traveling Commons to the riches of silence. ☯

Reuben's table car journeys did not lead him around the planet, but rather ended in Texas after five months. "The car is now in a cemetery somewhere in Austin. I left it there after I went crazy, and hitchhiked back to California." Today he lives on a leaking boat in the Emeryville harbor. A few months ago he returned from an artist's residency in India where he made 12-foot butterflies out of bamboo and rickshaw parts. Before that, he went to Florence, St. Petersburg, and Scotland to learn drawing and painting. At 31, he has never worked at a job for money longer than six weeks. Most of the work was constructing magnetic-proof buildings for scientists. He also plays the accordion, "but not that well." —EP/PW

REUBEN MARGOLIN



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The HypercarSM

by Michael K. Stone

Can the car be saved? Is it worth saving? Should all efforts go into promoting bicycles, pedestrian zones, public transportation, and community planning to free us from auto-dependence? What to do when there is no widespread willingness to abandon the independence and mobility of personal vehicles? If we must have cars, then how to maximize their efficiency and safety and minimize environmental harm? Enter the Hypercar.

The Hypercar is more a set of concepts than a particular design. Over the last decade, both at Rocky Mountain Institute (RMI; see access below) and in the R&D departments of major auto makers, components and configurations have been invented.

According to Thammy Evans, RMI's assistant director of transportation solutions, today's key elements include an ultra-lightweight body, a super-aerodynamic shape, a hybrid-electric drive, and efficient accessories. "Separately," she says, "these...have advantages and disadvantages, but combining them allows a synergy...multiplying benefits."

Advanced polymer composites, reinforced with carbon fiber and Kevlar, are much lighter—and much stronger and stiffer—than steel. They can absorb five times more energy in a collision. Better aerodynamics can reduce drag by 40 to 50 percent.

Hybrid-electric cars (such as the Honda Insight and Toyota Prius) that combine electric motors and gasoline engines are available now and a step toward the Hypercar. Automakers promise hybrids using

hydrogen fuel cells instead of gasoline between 2003 and 2005.

"Hypercars," says Thammy Evans, "would be as different from today's cars as computers are from typewriters—they'd be not so much cars with microchips as computers on wheels." Computers could control and monitor fuel economy, suspensions, braking, tire pressure, heating, and air conditioning—offering better acceleration, many-times improved fuel economy, and comfort, for a price comparable to today's gasoholics. No more links between roads and climate change? An OPEC-free world?

ROCKY MOUNTAIN INSTITUTE

1739 Snowmass Creek Road, Snowmass, CO 81654-9199. 970/927-3851, www.rmi.org

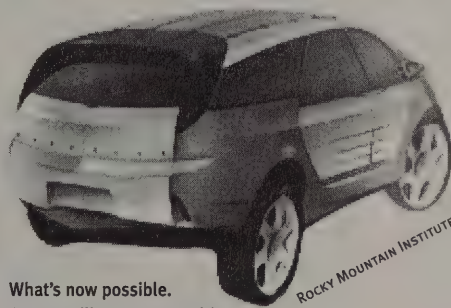
HYPERCAR, INC.

Midland Avenue, Suite 202, Basalt, CO 81621. www.hypercar.com

RMI founded the Hypercar Center[®] in 1994 to research and promote Hypercar feasibility, and in 1999 spun off Hypercar, Inc. Both websites are traffic jams of info/news.

RMI provides these downloadable fact sheets, see www.rmi.org/sitepages/pid392.php

1. The Basics of the HypercarSM Strategy
2. HypercarSM Vehicles Run On Hydrogen
3. Transition to HypercarSM Vehicles
4. HypercarSM Safety—Composites & Hydrogen
5. The Environmental Benefits of HypercarSM Mobility



What's now possible. Sports utility Hypercar with Mercedes comfort, safety; BMW acceleration, handling; truck traction; zero emissions; 117 mpg as direct H₂; and 620 miles before next fill-up.

Electrifying Times

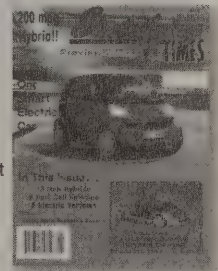
Herein is the latest news in electric-powered mobility and how its proponents and heroes are thinking. See lots of hardware (much of it described solely by the manufacturer's claims). Read uncritical road tests by enthusiasts. Partake of much hopeful speculation and daring attempts. Decry the lack of experienced comparisons of the competing technologies and the costs thereof—there's not yet enough experience to know what's best. Lots of high spirits inspire you to join the fray. This is typical of a publication riding the wave of an exciting technology that's vigorously developing before your very eyes. Lots to learn from the advertisements, too. —J. Baldwin

"Even though [the Luciole EVS-14] is a tiny and unique car, and its roof and stubby rear spoiler are covered with solar cells (arrghh), it is somehow totally cool looking. What really sets the Luciole apart from all others, is the fact that it is a tandem seat vehicle...one driver seat up front and one rear seat directly behind it. Definitely a space saver on the streets and in parking lots. —JOHN WAYLAND

Electrifying Times

Latest Electric Car News

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BamBucicletas

by Steen Heinsen

I am riding a bamboo bicycle through the main street of Christiania [the “free town” within the city of Copenhagen]. Usually it takes quite a bit to make the roughies turn their heads—but this bamboo bicycle does the trick. It is beautiful, light and fast—and it is nice to touch.

As I park the bamboo bicycle in front of the shop in order to have a black currant juice it feels almost as if I am dis-

mounting a Harley right next to a café—several people come over to touch the frame and to check out how the bike is made.

Where have you got that from, they ask, here in the Paradise of Bicycles, the almost car-free town in the middle of Copenhagen?

Well, from the Smithy next to the Grey Hall. The Smithy of Christiania has for the last thirty years been a furnace of innovation on the bicycle front. First came the Dursly-Pedersen bicycle, whose rider feels like he is in a camel's saddle. Then came the bicycle trailer, which became the way car-free families transport groceries on holidays and on weekdays, and at the moment the Smithy sells carrier bicycles for the transportation of children and many an odd purpose. And now the bamboo bicycle.

Flavio Deslandes is the man behind the development of a bicycle made of bamboo. He is Brazilian and an industrial designer from the PUC-Rio University. I met him in his small workshop next to the Smithy.

The bicycle is one of the world's most brilliant inventions. Light bicycles are made from aluminum, which is one of the most resource-demanding materials that exist. “My bicycles are made of grass,”



Flavio says.

Flavio makes me see things differently: Bamboo is a resource of immense potential. And it is strong too. What makes it possible to make bicycles from it is that it is stronger than steel (17 percent stonger, to be exact) when strained in the longitudinal direction.

I can stuff my thoughts about squeaky furniture. History teaches us that it was bamboo fiber glowing in Edison's first electric bulb, and that it was bamboo that kept the very first airplanes in Paris, constructed by Santos Dumont, together. Bamboo is

world employed, that it grows without fertilizer, and

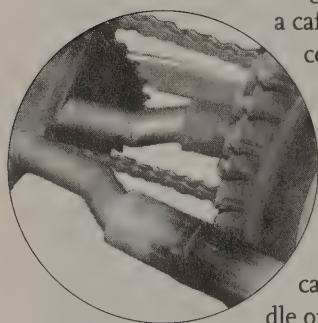
that it can be used for almost everything—from tasty rice dishes to building material.

While Flavio turns on the computer, he tells me a couple of more facts about bamboo. The first thing flowering in Hiroshima after the bomb had destroyed everything was—take a guess. The only building still standing after the earthquake in Costa Rica in 1992 was—yes, that is the correct answer.

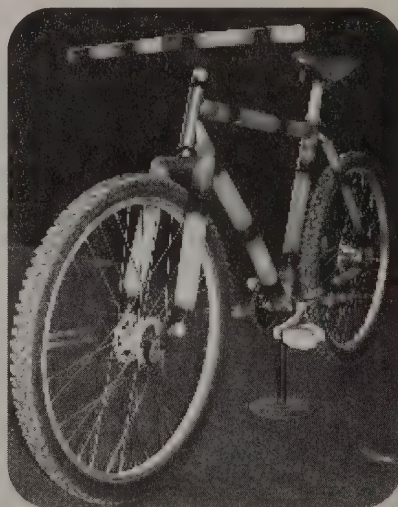
Flavio searches in his CAD program and comes up with a wheel. Not that he invented it, but he looks just like he did when he looks up at me with sparks in his jet black eyes.

“This is going to be a revolution: the bicycle wheel made out of bamboo. There is steel in the assemblies of my bicycles. But unlike everything else that is made out of bamboo—for instance the furniture that you talked about—the steel used here serves the bamboo, not the other way around. I use bamboo in its natural form in the bicycle. If you start bending it, drilling holes in it, or putting nails or spikes into it you'll weaken the structure,” he says. He shows me how every part of the frame is fitted into the assembling and kept in place with glue.

“But I keep on researching in order to find even more replacements for the metal parts. This wheel here is 100-percent bamboo: rims and hub are made out of laminated bamboo



The metal frame fits into the bamboo chainstay.



beneficial to the CO₂ value of the atmosphere. While growing it emits more oxygen than the equivalent amount of wood pulp.

So please caress your bamboo bicycle gently while you marvel at the thought that bamboo keeps more than two billion people around the

Reprinted with permission from the American Bamboo Society website, americanbamboo.org. [Suggested by Lynda Winslow.]

and the spokes are made out of straight bamboo sticks. I also work on being able to produce pedals and pedal arms in bamboo.

“Building these bicycles is art. It is not something you just do. Every bamboo must be selected and fitted into the frame according to size and quality. The secret lies in treating and handling the material the right way. Learning that takes time and the maintenance takes time as well. Just like it takes time to learn how to play football.”

BamBucicletas

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Kool-Stop Wilderbeast

In my view, bicycle “panniers” are, by themselves, unwieldy, difficult to pack, and, in our high-tech world, generally too small to carry all the items I seem to want to take even on short trips.

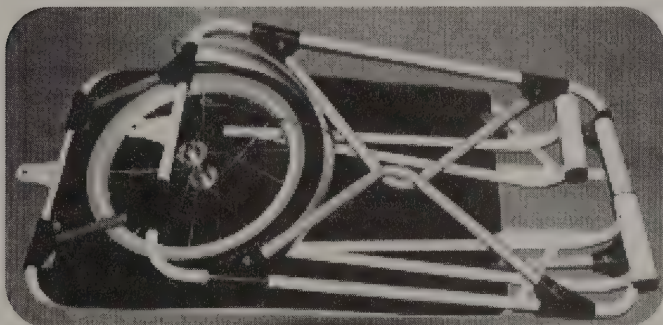
When my children were younger, I owned a Cannondale Bugger trailer, which was great for towing children and for the occasional trip to the grocery store, but too heavy and cumbersome for touring. So when my kids outgrew the Bugger, I decided I needed something that would allow me to be the nomad I always fancied myself to be. Enter the KOOL-STOP Wilderbeast cargo trailer.

The Wilderbeast is a single-track, one-wheeled trailer made of 4130 Chrome-Moly tubing. It attaches to the bicycle with an ingenious tongue attachment system. The Wilderbeast weighs 18 lbs., has dimensions of 40"x 18"x 8" (folded), and carries up to 70 lbs. I opted to purchase the generously sized (3 cubic ft.) duffel bag with a plastic bottom insert that fits snugly within the frame of the trailer. Although a pannier tongue attachment is available, I chose to put whatever does not fit in the duffel into dry bags bungee-corded on top of it.

I have used the Wilderbeast for road trips, off-road trips, and neighborhood trips. The low center of gravity, positive caster in the center-pull tongue pivot, and single-track design make this trailer highly maneuverable and prevent it from interfering with the handling of the bike. The fender on the tire keeps water and debris off the load. And the aluminum rim and hub, stainless steel spokes, and plastic trailer platform ensure durability.



You can visit KOOL-STOP on the web, but you cannot purchase the Wilderbeast or any of KOOL-STOP's other trailers directly from the manufacturer. KOOL-STOP has a “think globally, buy locally” philosophy, and all sales are conducted through authorized dealers. However, from what I understand, it is not difficult to become an authorized dealer—when I told my local bicycle shop owner that I wanted the trailer, he was able to order it the next day. Despite the fact that the company insists on involving a “middle man,” the trailer costs less than competitive models. The advantage is that the local dealer is available to provide repairs under the ten-year limited warranty.
—Daniel F. Norfleet



The Wilderbeast folds up for easy storage and transport.

Kool-Stop Wilderbeast

\$289 suggested retail price
Kool-Stop Originals, Inc.
PO Box 3480, La Habra, CA 90632
800/247-9754, www.koolstop.com



The Wilderbeast in action. 100-percent Chrome-Moly with a weight capacity of 70 lbs; it's highly maneuverable and doesn't interfere with riding the bike.



Is a Hydrogen Car Competitive?

Back-of-the-Envelope Optimism

by Bret J. Logue

The fuel cost per mile for the Ford Escape SUV, assuming \$1.50 per gallon and 20 mpg, is 7.5 cents per mile (or 9 cents per mile at \$1.80 a gallon). With improvements in hydrogen burning using Precision Spark Injectors, says Roy McAlister at the American Hydrogen Association, a hydrogen-fueled Ford Escape SUV would increase fuel efficiency by 50 percent. Instead of 20 mpg, it would attain 30 miles per gallon of gasoline equivalent (GGE). A hydrogen Ford Escape has not been tested, but these calculations should encourage us to settle the current debate on whether internal combustion engines that can be converted to run on hydrogen will reach 1.3 or 1.5 times the gasoline-only potential.

But two more big questions for hydrogen remain: how will it be produced and how much will it cost? I will address two scenarios, each with two variations, for hydrogen production: (1) using natural gas delivered (a) by pipeline or (b) by tube trailer; or (2) using wind-generated electricity to produce hydrogen (a) at the windmill site or (b) at the fill-up station.

If we accept that natural gas prices could stabilize at \$5 per MMBTU, then the hydrogen produced from natural gas would cost approximately twice that, or \$10 per MMBTU (info from Air

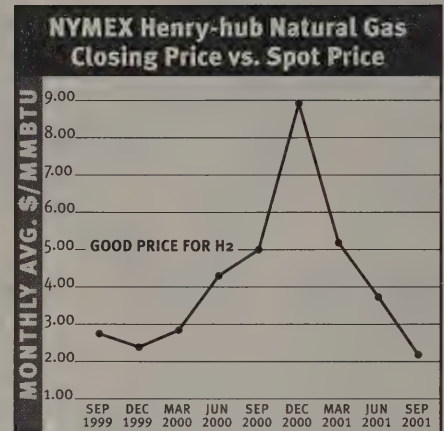
Products and Chemicals Corporation), or the wholesale gasoline equivalent of \$1.20. Assume for this natural gas scenario that no new tax will be charged on hydrogen. Then, with the cost of pipeline delivery approximately \$.30 per GGE, and the standard gross markup of gasoline at retail pumps of 15 percent, the total at-the-pump price is \$1.76.

The cost per mile of natural gas-derived hydrogen is \$1.76 divided by 30 mpg or 5.8 cents per mile. This is less than the cost per mile for the gasoline only Ford Escape SUV. But hydrogen might be delivered via tube trailers rather than by pipeline for the next decade or so. Tube trailing would cost \$1 per GGE, resulting in a more realistic pump cost of \$2.59 and a per-mile cost of 8.6 cents per mile. This would be about a penny more per mile than \$1.50 gasoline, and less than \$1.80 gas.

Green Hydrogen

If we want "green" hydrogen from wind, the calculations differ slightly. We need to find a wind company willing to sell us off-peak electricity at \$.03/kWh (currently most sell off-peak electricity at \$.015/kWh). The amortized capital cost of the electrolyzer needed to produce hydrogen from water is approximately \$.01/kWh. It requires 41.4 kWh of electricity to create the hydrogen equivalent of a gallon of gasoline (one gallon of gasoline equals approximately 35 kWh, and the efficiency of electrolysis is approximately 85 percent). Therefore the total cost of wind-hydrogen is \$.04 times 41.4, or \$1.65 per GGE wholesale.

If we produced the hydrogen at the wind turbine site, then we must deliver the hydrogen to the fill-up station. The cost of pipeline delivery is approximately \$.30 per GGE. But we could alternatively send wind-turbine electricity through the grid and manufacture



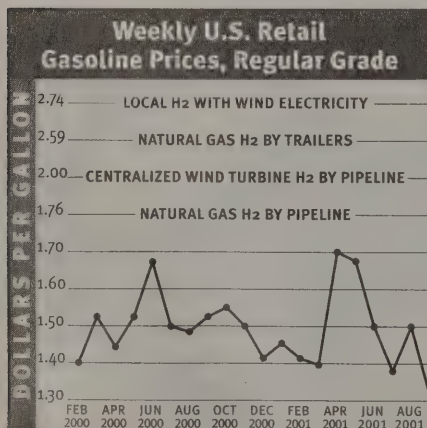
hydrogen locally. Using the grid has a transmission cost of \$.93 per GGE. Tack on the standard refueling station profit of 15 percent, and the total cost would be \$2 for wind-turbine/pipeline hydrogen and \$2.74 for grid-delivered/distributed production. Therefore, the cost of "green" hydrogen would be 6.7 cents and 9.1 cents per mile respectively for centralized and distributed production. Green hydrogen can thus be competitive when gas goes over \$1.80 per gallon, as it has in California.

Converting to Hydrogen

The cost to convert existing vehicles will be approximately \$2,000. If the car's expected post-conversion life is five years and 50,000 miles, then the added capital cost of conversion is \$.04 per mile. On average people would pay between \$400 and \$600 more per year for a converted hydrogen-fueled vehicle.

Because conversion of tens of millions of cars is costly and difficult on a massive scale, the smartest transitional step to fuel cell cars is to produce all new cars as hybrids that run on pure hydrogen. This will be a giant step toward the ultimate—a fuel-cell car that produces its own hydrogen onboard. **WE**

Bret Logue is director of research and communications for the Solar Economy Institute. He is founder of Protium, a hydrogen- and wind- energy company.



Jump-Starting Renewables

What it Takes to Enter the Hydrogen Era

As Chair of Point from 1995 to 1997, Ty saved Whole Earth. He was California governor Jerry Brown's coordinator for wind energy and president of the American Wind Energy Association. He's now director of the Solar Economy Institute. His other present love is deep thought about natural systems. —PW

by Ty Cashman

One of the best ways to understand how to bring about a hydrogen fuel economy quickly enough to halt global warming in a timely manner is to compare it to the development of wind energy in the late 1970s and early 1980s.

A number of us had been working very hard to bring about a wind energy revolution, with little success. Looking back, I noticed that nothing lasting happened until five strategic elements fell into place. Then, suddenly, 15,000 wind turbines were spinning in California in one of the fastest sustained developments of a new industry in peacetime. Since most of the actual development occurred during the Reagan administration, which was hostile to renewables, it is possible that *only* these five elements are necessary. Maybe they are both the necessary and sufficient conditions for an environmentally benign industry like a hydrogen economy to come into being.

In 1973 America experienced a great gasoline and fuel oil shortage due to an OPEC embargo. Prices went high and supply diminished. From the beginning of the oil crisis there was tremendous **public awareness** of the promise of wind energy and great **public support** for it. Because of this we had **political support**, a willingness in Washington, D.C. and California to encourage wind and solar energy by both tax incentives and changes in regulations. We had **high-priced competition**—oil prices were high and everyone expected they would continue to rise for a decade or so. But America had very little good wind energy **technology**. Several companies had designed prototype wind turbines, but in 1978 few American turbines

could withstand a serious wind for any length of time. Finally, apart from \$530 million that DOE put up for individual giant wind machines, there was no **capital** on which to build a wind energy industry.

In short, what kept a wind energy industry from blossoming was lack of technology and capital. This was our chicken-and-egg problem: no technology because no capital; no capital because no technology.

In 1978 the federal government created a tax credit for any individual purchasing a wind turbine, and the State of California passed an even more generous state tax credit. As a result, nearly \$2 billion in capital was taken out of the speculative California real estate market and put into the hands of American wind turbine manufacturers and California wind farm developers. This sudden flow of capital then drew to California more seasoned and reliable wind-turbine technology from Denmark's wind energy companies, who were suffering for lack of a market. Within the six-year lifespan of the California tax credit, the world wind energy industry went from a standing start to become the fastest growing energy industry in the world; it has continued to be the fastest ever since.

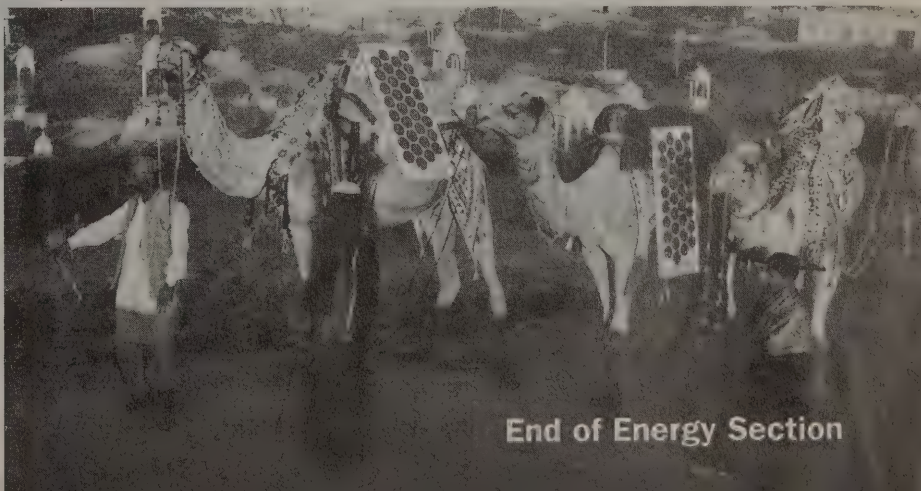
The wind energy industry required five elements before it could take off: (1) public awareness and support; (2) political support, especially for incentives; (3) high fossil fuel prices; (4) good technology; and (5) sufficient capital. Once all five elements were in place, nothing could stop it.

When we compare the situation of wind energy in 1978 to hydrogen energy in 2001, we find that a piece is missing, but it is a different piece this time. We have a range of good *technologies*, although needing some work and refinement. Wall Street has made commitments of billions of dollars of **capital**. We have **high fossil fuel prices** and expectations of them continuing. There was **DOE support for research and political encouragement** from the previous administration. (For the moment there is no White House support for hydrogen.) But, most surprisingly, what is almost completely missing is **public awareness and support**.

Public awareness and support was the strongest card in our hand in the 1970s. Today it is missing. Political support is also now weak, but with enough public awareness and vocal support for hydrogen energy, local and state government, and even Congress, can be expected to fall into line, passing the necessary incentives and regulations to overcome start-up inertia.

Once public awareness and support is strong, all five elements will be in place and the hydrogen era will zoom ahead. **WE**

MANDANJEET SINGH



Right: A caravan carrying PV panels arrives at the Indian city of Jaisalmer.

Dancing with Systems

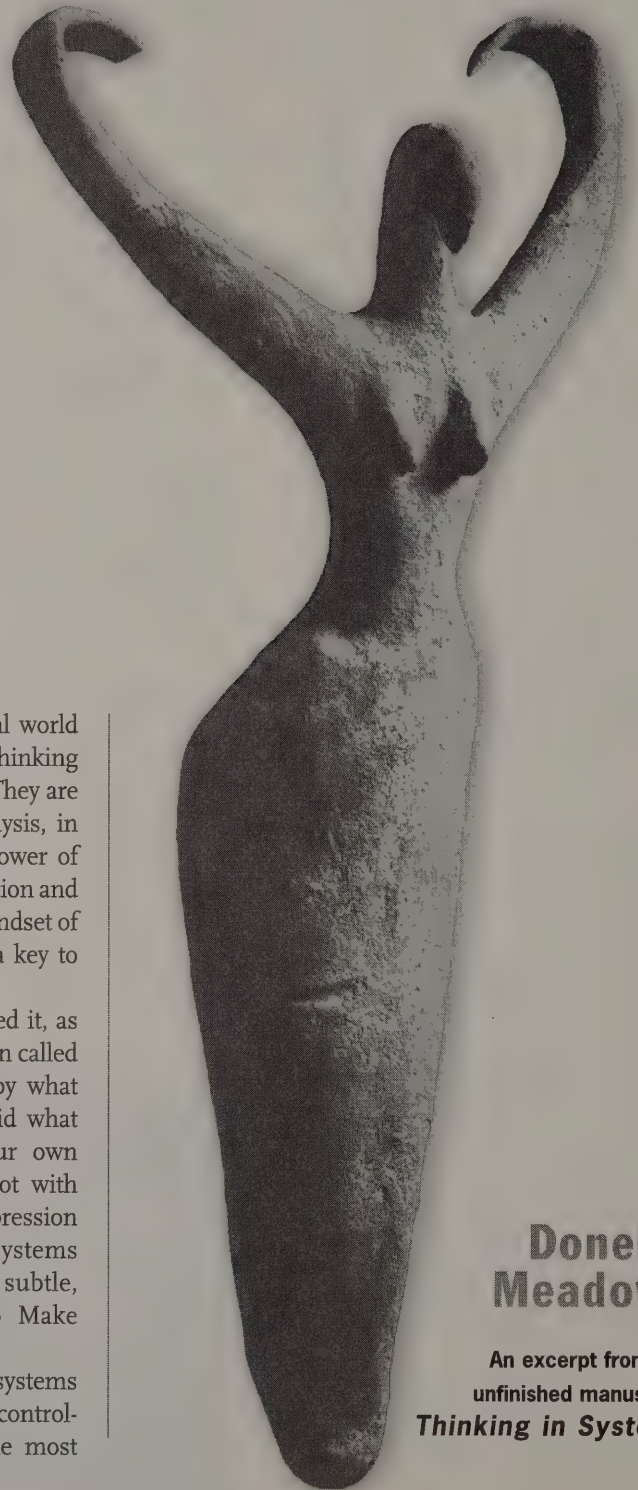
The Dance

1. Get the beat.
2. Listen to the wisdom of the system.
3. Expose your mental models to the open air.
4. Stay humble. Stay a learner.
5. Honor and protect information.
6. Locate responsibility in the system.
7. Make feedback policies for feedback systems.
8. Pay attention to what is important, not just what is quantifiable.
9. Go for the good of the whole.
10. Expand time horizons.
11. Expand thought horizons.
12. Expand the boundary of caring.
13. Celebrate complexity.
14. Hold fast to the goal of goodness.

People who are raised in the industrial world and who get enthused about systems thinking are likely to make a terrible mistake. They are likely to assume that here, in systems analysis, in interconnection and complication, in the power of the computer, here at last, is the key to prediction and control. This mistake is likely because the mindset of the industrial world assumes that there is a key to prediction and control.

I assumed that at first too. We all assumed it, as eager systems students at the great institution called MIT. More or less innocently, enchanted by what we could see through our new lens, we did what many discoverers do. We exaggerated our own ability to change the world. We did so not with any intent to deceive others, but in the expression of our own expectations and hopes. Systems thinking for us was more than subtle, complicated mindplay. It was going to Make Systems Work.

But self-organizing, nonlinear, feedback systems are inherently unpredictable. They are not controllable. They are understandable only in the most



**Donella
Meadows**

An excerpt from her
unfinished manuscript
Thinking in Systems

Egyptian
female
figurine,
c. 4000
B.C.E.

general way. The goal of foreseeing the future exactly and preparing for it perfectly is unrealizable. The idea of making a complex system do just what you want it to do can be achieved only temporarily, at best. We can never fully understand our world, not in the way our reductionistic science has led us to expect. Our science itself, from quantum theory to the mathematics of chaos, leads us into irreducible uncertainty. For any objective other than the most trivial, we can't optimize; we don't even know what to optimize. We can't keep track of everything. We can't find a proper, sustainable relationship to nature, each other, or the institutions we create, if we try to do it from the role of omniscient conqueror.

For those who stake their identity on the role of omniscient conqueror, the uncertainty exposed by systems thinking is hard to take. If you can't understand, predict, and control, what is there to do?

Systems thinking leads to another conclusion, however—waiting, shining, obvious as soon as we stop being blinded by the illusion of control. It says that there is plenty to do, of a different sort of “doing.” The future can't be predicted, but it can be envisioned and brought lovingly into being. Systems can't be controlled, but they can be designed and redesigned. We can't surge forward with certainty into a world of no surprises, but we can expect surprises and learn from them and even profit from them. We can't impose our will upon a system. We can listen to what the system tells us, and discover how its properties and our values can work together to bring forth something much better than could ever be produced by our will alone.

We can't control systems or figure them out. But we can dance with them!

I already knew that, in a way before I began to study systems. I had learned about dancing with great powers from whitewater kayaking, from gardening, from playing music, from skiing. All those endeavors require one to stay wide awake, pay close attention, participate flat out, and respond to feedback. It had never occurred to me that those same requirements might apply to intellectual work, to management, to government, to getting along with people.

But there it was, the message emerging from every computer model we made. Living successfully in a world of systems requires more of us than our ability to calculate. It requires our full humanity—our rationality, our ability to sort out truth from falsehood, our intuition, our compassion, our vision, and our morality.

I will summarize the most general “systems wisdoms” I have absorbed from modeling complex

systems and hanging out with modelers. These are the take-home lessons, the concepts and practices that penetrate the discipline of systems so deeply that one begins, however imperfectly, to practice them not just in one's profession, but in all of life.

The list probably isn't complete, because I am still a student in the school of systems. And it isn't unique to systems thinking. There are many ways to learn to dance. But here, as a start-off dancing lesson, are the practices I see my colleagues adopting, consciously or unconsciously, as they encounter systems.

1 Get the beat.

Before you disturb the system in any way, watch how it behaves. If it's a piece of music or a white-water rapid or a fluctuation in a commodity price, study its beat. If it's a social system, watch it work. Learn its history. Ask people who've been around a long time to tell you what has happened. If possible, find or make a time graph of actual data from the system. Peoples' memories are not always reliable when it comes to timing.

Starting with the behavior of the system forces you to focus on facts, not theories. It keeps you from falling too quickly into your own beliefs or misconceptions, or those of others. It's amazing how many misconceptions there can be. People will swear that rainfall is decreasing, say, but when you look at the data, you find that what is really happening is that variability is increasing—the droughts are deeper, but the floods are greater too. I have been told with great authority that milk price was going up when it was going down, that real interest rates were falling when they were rising, that the deficit was a higher fraction of the GNP than ever before when it wasn't.

Starting with the behavior of the system directs one's thoughts to dynamic, not static analysis—not only to “what's wrong?” but also to “how did we get there?” and “what behavior modes are possible?” and “if we don't change direction, where are we going to end up?”

And finally, starting with history discourages the common and distracting tendency we all have to define a problem not by the system's actual behavior, but by the lack of our favorite solution. (The problem is, we

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EDWARD R. TUFTS,
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need to find more oil. The problem is, we need to ban abortion. The problem is, how can we attract more growth to this town?)

2 Listen to the wisdom of the system.

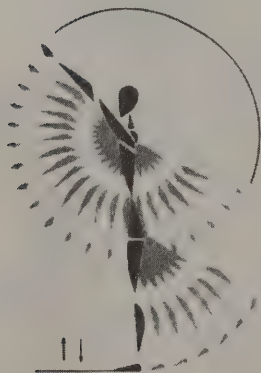
Aid and encourage the forces and structures that help the system run itself. Don't be an unthinking intervener and destroy the system's own self-maintenance capacities. Before you charge in to make things better, pay attention to the value of what's already there.

A friend of mine, Nathan Gray, was once an aid worker in Guatemala. He told me of his frustration with agencies that would arrive with the intention of "creating jobs" and "increasing entrepreneurial abilities" and "attracting outside investors." They would walk right past the thriving local market, where small-scale business people of all kinds, from basket-makers to vegetable growers to butchers to candy sellers, were displaying their entrepreneurial abilities in jobs they had created for themselves. Nathan spent his time talking to the people in the market, asking about their lives and businesses, learning what was in the way of those businesses expanding and incomes rising. He concluded that what was needed was not outside investors, but inside ones. Small loans available at reasonable interest rates, and classes in literacy and accounting, would produce much more long-term good for the community than bringing in a factory or assembly plant from outside.

3 Expose your mental models to the open air.

Remember, always, that everything you know, and everything everyone knows, is only a model. Get your model out there where it can be shot at. Invite others to challenge your assumptions and add their own. Instead of becoming a champion for one possible explanation or hypothesis or model, collect as many as possible. Consider all of them plausible until you find some evidence that causes you to rule one out. That way you will be emotionally able to see the evidence that rules out an assumption with which you might have confused your own identity.

You don't have to put forth your mental model with diagrams and equations, though that's a good discipline.



You can do it with words or lists or pictures or arrows showing what you think is connected to what. The more you do that, in any form, the clearer your thinking will become, the faster you will admit your uncertainties and correct your mistakes, and the more flexible you will learn to be. Mental flexibility—the willingness to redraw boundaries, to notice that a system has shifted into a new mode, to see how to redesign structure—is a necessity when you live in a world of flexible systems.

4 Stay humble. Stay a learner.

Systems thinking has taught me to trust my intuition more and my figuring-out rationality less, to lean on both as much as I can, but still to be prepared for surprises. Working with systems, on the computer, in nature, among people, in organizations, constantly reminds me of how incomplete my mental models are, how complex the world is, and how much I don't know.

The thing to do, when you don't know, is not to bluff and not to freeze, but to learn. The way you learn is by experiment—or, as Buckminster Fuller put it, by trial and error, error, error. In a world of complex systems it is not appropriate to charge forward with rigid, undeviating directives. "Stay the course" is only a good idea if you're sure you're on course. Pretending you're in control even when you aren't is a recipe not only for mistakes, but for not learning from mistakes. What's appropriate when you're learning is small steps, constant monitoring, and a willingness to change course as you find out more about where it's leading.

That's hard. It means making mistakes and, worse, admitting them. It means what psychologist Don Michael calls "error-embracing." It takes a lot of courage to embrace your errors.

5 Honor and protect information.

A decision-maker can't respond to information he or she doesn't have, can't respond accurately to information that is inaccurate, can't respond in a timely way to information that is late. I would guess that 99 percent of what goes wrong in systems goes wrong because of faulty or missing information.

If I could, I would add an Eleventh Commandment: *Thou shalt not distort, delay, or sequester information.* You can drive a system crazy by muddying its information streams. You can make a system work better with surprising ease if you can give it more timely, accurate, and complete information.

For example, in 1986 new federal legislation required US companies to report all chemical emis-

sions from each of their plants. Through the Freedom of Information Act (from a systems point of view one of the most important laws in the nation) that information became a matter of public record. In July 1988 the first data on chemical emissions became available. The reported emissions were not illegal, but they didn't look very good when they were published in local papers by enterprising reporters, who had a tendency to make lists of "the top ten local polluters." That's all that happened. There were no lawsuits, no required reductions, no fines, no penalties. But within two years chemical emissions nationwide (as least as reported, and presumably also in fact) had decreased by 40 percent. Some companies were launching policies to bring their emissions down by 90 percent, just because of the release of previously sequestered information.

6 Locate responsibility in the system.

Look for the ways the system creates its own behavior. Do pay attention to the triggering events, the outside influences that bring forth one kind of behavior from the system rather than another. Sometimes those outside events can be controlled (as in reducing the pathogens in drinking water to keep down incidences of infectious disease). But sometimes they can't. And sometimes blaming or trying to control the outside influence blinds one to the easier task of increasing responsibility within the system.

"Intrinsic responsibility" means that the system is designed to send feedback about the consequences of decision-making directly and quickly and compellingly to the decision-makers.

Dartmouth College reduced intrinsic responsibility when it took thermostats out of individual offices and classrooms and put temperature-control decisions under the guidance of a central computer. That was done as an energy-saving measure. My observation from a low level in the hierarchy is that the main consequence was greater oscillations in room temperature. When my office gets overheated now, instead of turning down the thermostat, I have to call an office across campus, which gets around to making corrections over a period of hours or days, and which often overcorrects, setting up the need for another phone call. One way of making that system more, rather than less, responsible, might have been to let professors keep control of their own thermostats and charge them directly for the amount of

energy they use. (Thereby privatizing a commons!)

Designing a system for intrinsic responsibility could mean, for example, requiring all towns or companies that emit wastewater into a stream to place their intake pipe *downstream* from their outflow pipe. It could mean that neither insurance companies nor public funds should pay for medical costs resulting from smoking or from accidents in which a motorcycle rider didn't wear a helmet or a car rider didn't fasten the seat belt. It could mean Congress would no longer be allowed to legislate rules from which it exempts itself.

7 Make feedback policies for feedback systems.

President Jimmy Carter had an unusual ability to think in feedback terms and to make feedback policies. Unfortunately he had a hard time explaining them to a press and public that didn't understand feedback.

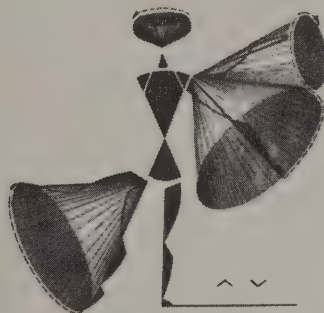
He suggested, at a time when oil imports were soaring, that there be a tax on gasoline proportional to the fraction of US oil consumption that had to be imported. If imports continued to rise the tax would rise, until it suppressed demand and brought forth substitutes and reduced imports. If imports fell to zero, the tax would fall to zero.

The tax never got passed.

Carter was also trying to deal with a flood of illegal immigrants from Mexico. He suggested that nothing could be done about that immigration as long as there was a great gap in opportunity and living standards between the US and Mexico. Rather than spending money on border guards and barriers, he said, we should spend money helping to build the Mexican economy, and we should continue to do so until the immigration stopped.

That never happened either.

You can imagine why a dynamic, self-adjusting system cannot be governed by a static, unbending policy. It's easier, more effective, and usually much cheaper to design policies that change depending on the state of the system. Especially where there are great uncertainties, the best policies not only contain feedback loops, but meta-feedback loops—loops that alter, correct, and expand loops. These are policies that design learning into the management process.



8 Pay attention to what is important, not just what is quantifiable.

Our culture, obsessed with numbers, has given us the idea that what we can measure is more important than what we can't measure. You can look around and make up your own mind about whether quantity or quality is the outstanding characteristic of the world in which you live.

If something is ugly, say so. If it is tacky, inappropriate, out of proportion, unsustainable, morally degrading, ecologically impoverishing, or humanly demeaning, don't let it pass. Don't be stopped by the "if you can't define it and measure it, I don't have to pay attention to it" ploy. No one can [precisely] define or measure justice, democracy, security, freedom, truth, or love. No one can [precisely] define or measure any value. But if no one speaks up for them, if systems aren't designed to produce them, if we don't speak about them and point toward their presence or absence, they will cease to exist.

9 Go for the good of the whole.

Don't maximize parts of systems or subsystems while ignoring the whole. As Kenneth Boulding once said, don't go to great trouble to optimize something that never should be done at all. Aim to enhance total systems properties, such as [creativity], stability, diversity, resilience, and sustainability—whether they are easily measured or not.

As you think about a system, spend part of your time from a vantage point that lets you see the whole system, not just the problem that may have drawn you to focus on the system to begin with. And realize that, especially in the short term, changes for the good of the whole may sometimes seem to be counter to the interests of a part of the system. It helps to remember that the parts of a system cannot survive without the whole. The long-term interests of your liver require the long-term health of your body, and the long-term interests of sawmills require the long-term health of forests.

10 Expand time horizons.

The official time horizon of industrial society doesn't extend beyond what will happen after the next election or beyond the payback period of current investments. The time horizon of most families still extends farther than that—through the lifetimes of children or grandchildren. Many Native

American cultures actively spoke of and considered in their decisions the effects upon the seventh generation to come. The longer the operant time horizon, the better the chances for survival.

In the strict systems sense there is no long-term/short-term distinction. Phenomena at different timescales are nested within each other. Actions taken now have some immediate effects and some that radiate out for decades to come. We experience now the consequences of actions set in motion yesterday and decades ago and centuries ago.

When you're walking along a tricky, curving, unknown, surprising, obstacle-strewn path, you'd be a fool to keep your head down and look just at the next step in front of you. You'd be equally a fool just to peer far ahead and never notice what's immediately under your feet. You need to be watching both the short and long terms—the whole system.

11 Expand thought horizons.

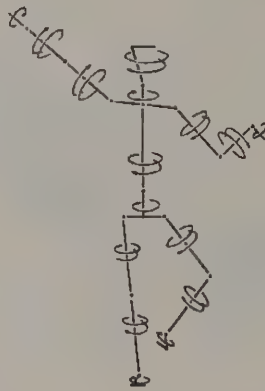
Defy the disciplines. In spite of what you majored in, or what the textbooks say, or what you think you're an expert at, follow a system wherever it leads. It will be sure to lead across traditional disciplinary lines. To understand that system, you will have to be able to learn from—while not being limited by—economists and chemists and psychologists and theologians. You will have to penetrate their jargons, integrate what they tell you, recognize what they can honestly see through their particular lenses, and discard the distortions that come from the narrowness and incompleteness of their lenses. They won't make it easy for you.

Seeing systems whole requires more than being "interdisciplinary," if that word means, as it usually does, putting together people from different disciplines and letting them talk past each other. Interdisciplinary communication works only if there is a real problem to be solved, and if the representatives from the various disciplines are more committed to solving the problem than to being academically correct. They will have to go into learning mode, to admit ignorance and be willing to be taught, by each other and by the system.

It can be done. It's very exciting when it happens.

12 Expand the boundary of caring.

Living successfully in a world of complex systems means expanding not only time horizons and thought horizons; above all it means expanding the



horizons of caring. There are moral reasons for doing that, of course. And if moral arguments are not sufficient, systems thinking provides the practical reasons to back up the moral ones. The real system is interconnected. No part of the human race is separate either from other human beings or from the global ecosystem. It will not be possible in this integrated world for your heart to succeed if your lungs fail, or for your company to succeed if your workers fail, or for the rich in Los Angeles to succeed if the poor in Los Angeles fail, or for Europe to succeed if Africa fails, or for the global economy to succeed if the global environment fails.

As with everything else about systems, most people already know the interconnections that make moral and practical rules turn out to be the same rules. They just have to bring themselves to believe what they know.

13 Celebrate complexity.

Let's face it, the universe is messy. It is nonlinear, turbulent, and chaotic. It is dynamic. It spends its time in transient behavior on its way to somewhere else, not in mathematically neat equilibria. It self-organizes and evolves. It creates diversity, not uniformity. That's what makes the world interesting, that's what makes it beautiful, and that's what makes it work.

There's something within the human mind that is attracted to straight lines and not curves, to whole numbers and not fractions, to uniformity and not diversity, and to certainties and not mystery. But there is something else within us that has the opposite set of tendencies, since we ourselves evolved out of and are shaped by and structured as complex feedback systems. Only a part of us, a part that has emerged recently, designs buildings as boxes with uncompromising straight lines and flat surfaces. Another part of us recognizes instinctively that nature designs in fractals, with intriguing detail on every scale from the microscopic to the macroscopic. That part of us makes Gothic cathedrals and Persian carpets, symphonies and novels, Mardi Gras costumes and artificial intelligence programs, all with embellishments almost as complex as the ones we find in the world around us.


14 Hold fast to the goal of goodness.

Examples of bad human behavior are held up, magnified by the media, affirmed by the culture, as typical. Just what you would expect. After all, we're only human. The far more numerous examples of human goodness are barely noticed. They are Not News. They are exceptions. Must have been a saint. Can't expect everyone to behave like that.

And so expectations are lowered. The gap between desired behavior and actual behavior narrows. Fewer actions are taken to affirm and instill ideals. The public discourse is full of cynicism. Public leaders are visibly, unrepentantly, amoral or immoral and are not held to account. Idealism is ridiculed. Statements of moral belief are suspect. It is much easier to talk about hate in public than to talk about love.

We know what to do about eroding goals. Don't weigh the bad news more heavily than the good. And keep standards absolute.

This is quite a list. Systems thinking can only tell us to do these things. It can't do them for us.

And so we are brought to the gap between understanding and implementation. Systems thinking by itself cannot bridge that gap. But it can lead us to the edge of what analysis can do and then point beyond—to what can and must be done by the human spirit. 

Donella Meadows wrote one of our most popular essays, "Places to Intervene in a System" (*Whole Earth*, Winter 1997). We had no idea that she had continued to think past this brilliant essay to the next stage: What happens if the system doesn't change, and frustration, anger, exhaustion and sadness set in? Then Andrew Jones, Elizabeth Sawin, and Diana Wright of Sustainability Institute, an institute founded by Donella, said they were working to bring to publication a book she had written on systems thinking. In advance of that publication, they wanted to share an excerpt from Donella's book with us.

For new readers, Donella, was a dear friend and a contributing editor of *Whole Earth*. She died last spring from meningitis. She coauthored *The Limits to Growth*, syndicated "The Global Citizen," lived and worked on an organic farm, taught at Dartmouth, helped found the Balaton Group on sustainability, and was a MacArthur Fellow. In her honor, we hope all those interested in sustainability will continue to learn about and support the ongoing work of the Sustainability Institute (3 Linden Road, Hartland, VT 05048, www.sustainabilityinstitute.org, or contact Hal Hamilton Executive Director, hhamilton@centerss.org). Here's what the staff

of SI wrote when they sent the excerpted chapter:

"At Sustainability Institute we work to help people transform systems that are economically or environmentally unsustainable—systems that are producing, in various combinations, pollution, resource depletion, inequity, and despair.

"We have a powerful set of analytical tools, smart, eloquent, tireless collaborators from within these systems, and a clear vision of how these systems could be better, healthier, and more resilient. Yet, in most of these projects, we reach a point where we discover that none of this is enough.

"We discover that we can't force the system into a new shape. It resists our efforts, slips through our fingers, moves along in the same old unwelcome pattern. We rediscover that transforming the behavior of systems involves not only uncovering the intervention points that might shift the behavior of the whole system, but also a search for wisdom, a style of restraint, and an expansion of caring.

"Most of what we know about ways to intervene in systems we learned from Donella. Now, months after her death, as we sort through our 'lessons from Dana' we also realize how much she taught us about humility, caring, wisdom, and learning." —EP/PW

One Universe

Ah, what a universe! Maybe only a little one in the grander multiverse of the ultimate cosmos, but it is where we live. Our universe, defined by only six constants, such as the speed of light and the pull of gravity, and by only the four known laws of thermodynamics. I used to dream I could saddle up a light beam and then inch my body up the beam. Both astrophysics and I were too young to know that in my dream I was space/time traveling into another universe organized by different constants and, perhaps, a different Big Bang.

One Universe, though spectacularly beautiful, is not a coffee table book with lots of gripping photos and minimal text. It has a smart and comprehensible text, info-captions, colorized astro-images, and elegantly rendered 3-D diagrams—all woven together with intelligence and pizzazz.

Here in our itty-bitty universe, in which everything moves, and matter and energy tangle and disattach, there remain lots of mysteries and invisible powers. These cosmic forces once proclaimed themselves as gods and goddesses. Now, in One Universe, they sport monikers like Galactic Tide, Shepherd Moon, Fermion, Quark, Gluon, and Gravitron. So read all about it: the Pulsing Heart of the Crab Nebula, the Violet Shift as light spirals into a black hole, Earth's Precession, the Retrograde Mystery, and Cosmic Magnetospheres. It's science's depiction of our secular cosmos at its best. —PW [Suggested by Charlene Spretnak and Brian Swimme.]

“...no wall separates our Earth and sky from the rest of the cosmos. We live in One Universe.

Some of those connections are easy to see. A crystal hanging in a window lights the room with bands of color on a sunny day. We use more elaborate crystals to break up light from stars and galaxies. Special instruments extract hidden details from those delicate rainbows, revealing what the objects are made of and how they move through space. Baseball fans watch the cosmos at work when they follow the arc of a home run soaring into the bleachers. The arc is a perfect illustration of the ever-present force of gravity, which pins us to the ground, keeps the Moon in orbit around Earth, and steers our Sun through our Milky Way galaxy. The Moon and the Sun also exert gravitational pulls on Earth, creating tides that we see as the twice-daily ebb and flow of the ocean. Stronger tides



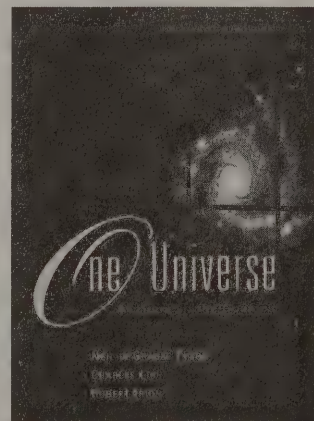
An x-ray source known as Cygnus X-1 was discovered in the early 1970s. The visible member of this binary star system is a blue supergiant with a mass about thirty times greater than the sun's. Hot gas from the star is flowing toward its unseen companion, a black hole. The x-ray-emitting region may be an accretion disk formed when matter from the supergiant was drawn into the rotating black hole.

elsewhere in the universe turn the insides of moons to mush and stretch pairs of closely orbiting stars into egglike shapes.

“Today's best candidate for such a unifying description is called string theory. For a moment, suspend all preconception you have about matter to entertain what string theorists claim. In the standard model, we can think of particles as points of mass. *No*, say string theorists; particles actually are minuscule strings or membranes that vibrate in space. Each particle would represent a different mode of vibration of the strings, much as a single guitar string can create many notes. The forces of nature would arise from the harmony of the interacting strings.

“One crucial puzzle goes by the name of “dark matter.” Simply put, this is stuff we can't see, yet it exerts a gravitational pull like visible matter. Objects that shine may dominate our images of the cosmos, but they hardly make a difference in the big picture of mass in the universe. At least 90 percent of all mass out there is invisible in any wavelength of light—perhaps as much as 99

percent. Indeed, if our telescopes observed gravity rather than light, the cherished galaxies in galaxy clusters would appear as insignificant blips amid giant gravitational fields.



**One Universe
At Home in the Cosmos**
Neill deGrasse Tyson, Charles Liu,
and Robert Irion
2000; 218 pp.
\$40
Joseph Henry Press

Encyclopedia of the Biosphere

Here's an eleven-volume work that only Whole Earth or Library Journal would review. The original edition (1993-98) was in Catalan. Now in English, Encyclopedia of the Biosphere has 4,000 photographs, myriads of maps and diagrams, and special inserts on specific topics such as eiderdown, the history of languages in the Caucasoid Mountains, and the Gaia Hypothesis.

With this readable, breezy, immense survey, Whole Earth and everybody else has, in a single publication, a whole Earth history and great info for bioregional advocates. I especially like the intros to biospherics (Volumes 1 and 11) and the depictions of local peoples. The Encyclopedia celebrates regional competence and livelihoods with oodles of interesting facts; for instance, how air pressure changes the blood of high-altitude peoples, and how their lack of iodine increases goiters. We urbanites can forget that bioregional peoples—living intimately with croplands, forests, fisheries, and grasslands—still make up half the planet's population.

The Encyclopedia's flavor is UNESCO—sweetly humane and a bit romantic. For example, it depicts UNESCO's biosphere reserve system with no indication that many of these reserves have fallen apart or that other forms of protecting biomic jewels have proved more effective. The technical info is extremely competent; the concepts clearly spoken, up-to-date, and gorgeously illustrated.

If you have any influence on your library, or want to launch planetary consciousness within a favorite organization, encourage them to buy or donate these volumes. For readers from late high school and on. —PW

“You may find it hard to swallow the notion that anything as large and apparently inanimate as the Earth is alive. Surely you may say, the Earth is almost wholly rock and nearly all incandescent with heat. I am indebted to Jerome Rothstein, a physicist, for his enlightenment on this, and other things. In a thoughtful paper on the living Earth concept...he observed that the difficulty can be lessened if you let the image of a giant redwood tree enter your mind. The tree undoubtedly is alive, yet 99% [of it] is dead. The great tree is an ancient spire of dead wood, made of lignin and cellulose by the ancestors of the thin layer of living cells that go to constitute its bark. How like the Earth, and more so when we realize that many of the atoms of the rocks

far down in the magma were once part of the ancestral life from which we all have come.
—JAMES E. LOVELOCK, FROM *THE AGES OF GAI*

- Volume 1: Our Living Planet
- Volume 2: Tropical Rainforests
- Volume 3: Savannahs
- Volume 4: Deserts
- Volume 5: Mediterranean Woodlands
- Volume 6: Temperate Rainforests
- Volume 7: Deciduous Forests
- Volume 8: Prairies and Boreal Forests
- Volume 9: Lakes, Islands, and the Poles
- Volume 10: Oceans and Seashores
- Volume 11: The Biosphere Concept and Index

Compiling information in chromosomes

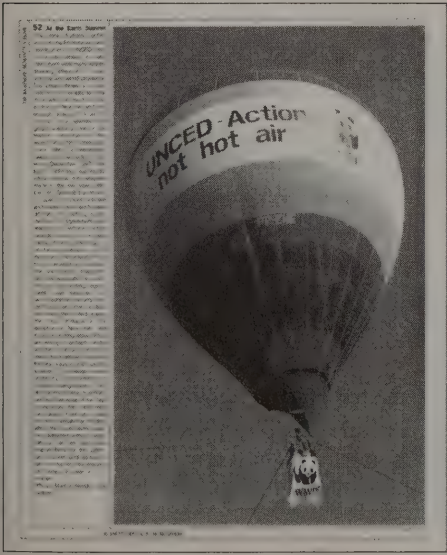
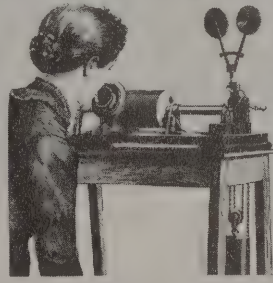
Nucleic acids, composed of chains of nucleotides, are particularly malleable materials. They are linear sequences, chains of molecules as in proteins, and potential message carriers. In terms of information they are comparable in content, music, and, in general, to our written or recorded messages.



Biological information is organized in a linear fashion, and the DNA molecule is a long, thin, flexible chain of nucleotides. The DNA molecule is a double helix, and the two strands are held together by hydrogen bonds between the nitrogenous base pairs. The DNA molecule is the carrier of genetic information, and it is the blueprint for the synthesis of proteins. The DNA molecule is also the site of mutations, which can lead to changes in the genetic code and the development of new traits.



The child is looking through a microscope, which is a device used to observe objects that are too small to be seen with the naked eye. The microscope consists of a lens system that magnifies the image of the specimen. The child is likely studying a biological specimen, such as a cell or a microorganism, and is trying to understand its structure and function. The microscope is an essential tool in biology and other scientific fields.



1.5 The various approaches within today's environmental movements

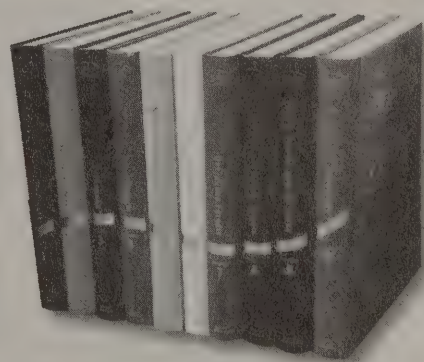
At the beginning of the twenty-first century, much of the focus of the environmental movement has shifted from a focus on environmental protection to a focus on environmental justice. This shift is reflected in the growing emphasis on social and economic justice within the environmental movement. The environmental movement is now a broad-based coalition of groups and individuals who are concerned about the environment and the well-being of all people.

The climate crisis facing ecology in the 21st century

The climate crisis is one of the most pressing environmental issues of our time. It is caused by the burning of fossil fuels and the release of greenhouse gases into the atmosphere. The climate crisis is leading to a rise in sea levels, more frequent and severe weather events, and a loss of biodiversity. It is a global problem that requires a global solution.

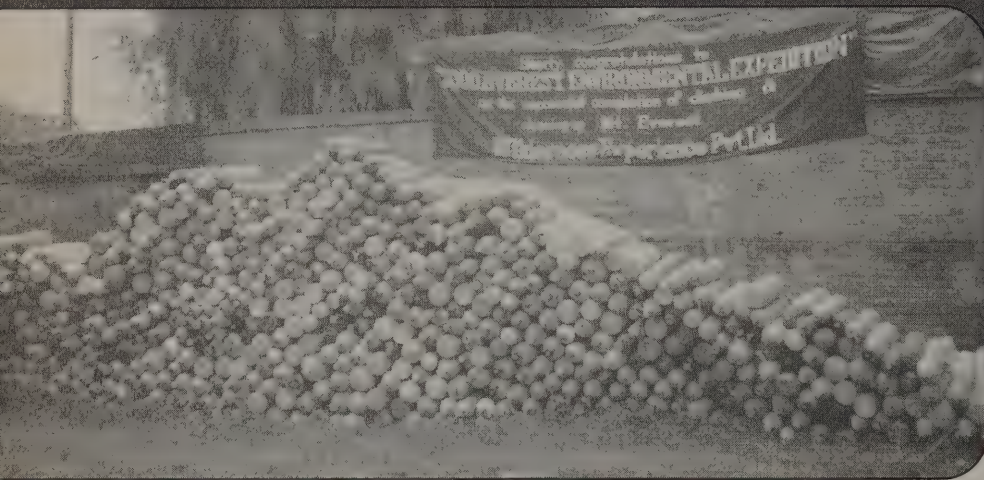
EGYPTIAN EGYELETET FÖLDIÉK! OR MISKOLCZ ÉRKEZTETÉSÉRE

This is a political poster from Hungary, featuring a woman's face and the text 'EGYPTIAN EGYELETET FÖLDIÉK! OR MISKOLCZ ÉRKEZTETÉSÉRE'. The poster is a call to action, likely related to a political event or campaign in Hungary.



Encyclopedia of the Biosphere
Humans in the World's Ecosystems
 Ramon Folch, project director
 2000; 11 volumes
 \$1,000
 Gale Group, 27500 Drake Road, Farmington Hills, MI 48331-3535. 800/877-GALE, 248/699-4253, www.galegroup.com
 [Suggested by Lynn Margulis]

THE HIGHEST LITTER BRIGADE



THE CLEAN-UP OF MT. EVEREST

by David Bolling

Above: West Ridge of Everest. Photo by David Bolling. Inset: 632 empty oxygen bottles—fifty years of Everest history piled in Kathmandu. Photo by Jamie Ross.

In March 2000 I accepted the job of my dreams with a “convergent media” environmental website that was going to promote and explain all things green. I was the outdoor and travel editor for Verde Media and before I even had a desk of my own Verde management told me they had become sponsors of a major expedition to both climb and clean off Mount Everest.

“That’s great,” I said. “We should send somebody.” Within a week I was on my way to Nepal.

Edmund Hillary and Tenzing Norgay were the first to summit Everest in 1953, although the British had been mounting expeditions since 1922. Many Everest campaigns resembled military assaults, and decades of climbing attempts had

left the mountain littered with uncountable tons of discarded equipment, spoiled food, human waste and bodies.

In Tibet, Everest is known as Chomolungma—the Goddess Mother of Earth. In Nepal its name is Sagarmatha—Mother of the Universe. Whatever you call it, Everest is sacred to millions of people. And yet the world’s highest mountain had become the world’s highest garbage dump, an insult to the mountain and those who love her.

In the early 1990s things began to change. Environmental policies were established, and some expeditions even began to bring out more garbage than they took in. Bob Hoffman, a climber from Belmont, California, had already done a couple

of Everest clean-ups when he decided to make 2000 the big push: to clear off all the trash, including some 700 discarded oxygen bottles and tons of smaller debris. My job was to document the effort for Verde while spending nearly two months at Everest base camp, 17,600 feet up on the Khumbu glacier. Using dual satellite uplinks I sent back daily video reports and an email journal of the expedition’s progress. I also reported on my own progress as a wannabe mountaineer who had never been above 15,000 feet.

Measured in objective terms, the expedition was a major success. Three Western climbers and ten Sherpas made it to the summit. A small army of clean-up Sherpas, working all the way up to Camp IV at



JAMIE ROSS

Left: Sherpas examine discarded oxygen bottle at Everest Base Camp. Right: The skeletal remains of an Everest climber killed in the Khumbu icefall, deposited twenty years later on the glacier below.



DAVID BOLLING

26,000 feet, brought down 632 old oxygen bottles, some dating back to the Hillary/Tenzing expedition, and about 300 kilos of trash.

Surviving Garbage Collection at 17,600 feet

At a subtler, more subjective level, the expedition was a lesson in physical and emotional survival in one of the harshest atmospheres on earth. Some of my more obvious conclusions were these:

When you're hiking to Everest, hike slowly. Altitude sickness can kill you—more people have died on the way to the mountain than climbing it. From the usual staging area in the

village of Lukla at 9,000 feet, it should take at least nine days to reach Everest Base Camp. While I was there two people—lowland porters who ascended too quickly—died on the trail.

If you spend a long time at Base Camp you will slowly waste away. Your oxygen-starved body will consume 5,000 calories a day, or more, but you can't eat that much because at times you'll be sick, at other times you won't be hungry, and the food is often unappetizing. You'll suffer from malabsorption, indigestion, and diarrhea; you'll have a continuous cough; you'll always be out of breath;



DAVID BOLLING

and your weight will just drop away. I lost twenty-five pounds, and I calculated that, had I stayed until September 16, I would have simply disappeared.

Because Base Camp has roughly half the oxygen of sea level, everything is harder to do, including sleeping. The thinner air tricks your body into thinking it is suffocating, and so you wake up periodically gasping desperately for breath. The solution is a diuretic drug that makes you wake up periodically desperately having to pee.

Yaks are wonderful animals, capable of carrying heavy loads to high altitudes while producing milk, butter, and wool. But don't get in the way of a yak on a high Himalayan trail. One of you will go over the edge, and it won't be the yak.

Base Camp managers sort garbage for transport off Everest.



JAMIE ROSS

Yaks carried more than four tons of empty oxygen bottles out of Everest Base Camp.

Tools for Highly Placed People (Many available online from REI.com)

DIAMOX

The brand name for acetazolamide, the drug that transforms periodic breathing into periodic peeing. Get the 250 mg tablets; see your doctor for a prescription. Prices vary.

SMARTWOOL SOCKS

Unlike polypro, wool doesn't stink after the first good sweat. I wore these socks exclusively and sometimes kept the same pair on, day and night, for a week (laundry is a luxury). They felt great—and didn't smell for at least four days. The heavy duty Mountaineering style are \$19.50 a pair and worth every dime. REI.

POLYPRO UNDERPANTS

Notwithstanding the comments above, polypro underwear dries quickly, even while you're wearing it, doesn't soil easily and will stink less than cotton. I wore the same underwear for four or five days. \$15 at REI.

LOZENGES FOR THE KHUMBU COUGH

The air is so dry on Everest that everyone gets a cough that lasts pretty much as long as they're there. I tore chest muscles coughing; broken ribs are common. Suck on something to lubricate your throat. Almost anything will work, including hard candies. I like Ricola cough drops, available at any drug store.

PRINCETON TEC HEADLAMP



Princeton Tec has set a new standard for headlamps. Theirs are waterproof far below any depth you'll ever dive; the four-battery version I took to Everest will light up a mountain; they're guaranteed for life; they fit comfortably on your head; and you can pop out the incandescent bulb for a long-lasting LED bulb module good for scores of hours of nighttime reading. The four-battery Princeton Tec Vortex, with one high-output halogen bulb and one long-term bulb is \$36 at REI. The Matrix LED lamp (with interchangeable incandescent bulb) is \$39.95 at REI.

A REALLY GOOD SLEEPING BAG

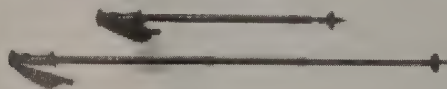
Rated to at least zero degrees F. I took a zero-degree Marmot Couloir, extra long. From Marmot, www.marmot.com, for \$439.

BABY WIPES

For the same reason you need ciprofloxacin. At Rite-Aid drugs for \$2.99.

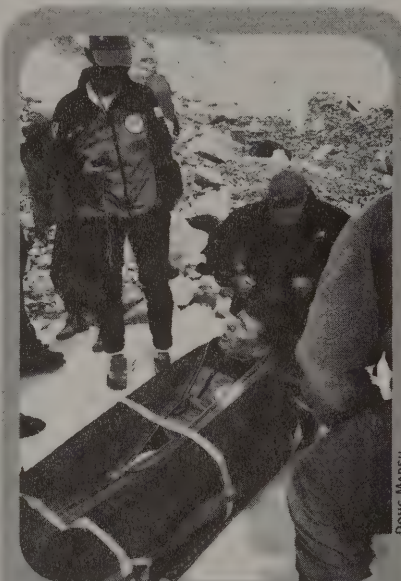
TREKKING POLES

I used to scoff at people who used these things, but the trail to Everest made me a believer. They're invaluable on steep terrain, like acquiring an extra set of legs. The best poles, hands down, are made by Leki; they're adjustable, spring-loaded, lightweight and exemplify German engineering. \$89.95 to \$119.95 at REI.



A PERSONAL WATER FILTER

I like the HealthShield Safe Water antimicrobial water bottle which you can dip into any stream and then instantly suck clean water through a protected rubber spout. It's 99.98 percent safe for giardia, cryptosporidium, and all other nasties except viruses. For that you can drop in some iodine, and the filter will remove the taste. 25 oz. bottle \$39.95 at REI.



DOUG MARSH

Gamow Bag (cost: thousands of \$)

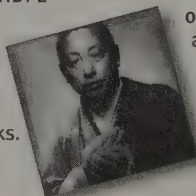
What do you do when you're stuck at 18,000 feet, dying from altitude sickness and the only cure is to get lower immediately? Thanks to Igor Gamow, a Russian physiologist, you can climb into one of the portable recompression chambers he designed and, while someone cranks air into the bag with a foot pump, you can safely begin a virtual descent that will get you out of the danger zone in a matter of minutes. Increased air pressure inside the Gamow Bag replicates lower altitudes and helps alleviate the severity of pulmonary or cerebral edema, which could kill you. That's me in the bag.

A PEE BOTTLE

It's 3 A.M. and you're awake for the third time having to pee. It's two degrees outside, with six inches of snow on your tent. What to do? Keep a Nalgene, wide-mouth water bottle in your tent. Women can buy anatomically fitted funnels to improve their aim. Everyone has a pee bottle. Don't go to Everest without one. At any outdoor supply store. 32 oz. HDPE wide-mouth loop-top bottle, \$5.75.

A FRISBEE

For the same reasons you take a Frisbee anywhere. Available just about anywhere for a couple of bucks.



CIPROFLOXACIN

Cipro is the drug of choice to nuke the microorganisms that cause diarrhea and other inevitable intestinal ailments in an environment where hygiene is more a loose concept than a reality. Of course, when you come back from Everest your intestines will be a dead zone where no friendly flora survive. Available by prescription. Prices vary.

ZITHROMAX

This miracle antibiotic will knock out the chronic bronchitis you get from coughing twenty-four hours a day. Its five-day, single-pill regime is the equivalent of the traditional two-week multi-pill dose and you'll feel a lot better by day three. Available by prescription. Expensive; typically \$50 or more for one five-day treatment.

A CAMP CHAIR

I've been carrying Crazy Creek chairs all over the world for about twenty years, and I wouldn't want to go to Everest without one. Their foam construction is good insulation for sitting on a glacier, you can stuff one in your backpack or lay it flat for extra comfort under your sleeping pad. \$38.50 at most outdoor stores.



A LARGE STASH OF EMERGENCY FOOD

(For when you can't survive another meal of yak steak and boiled potatoes.)

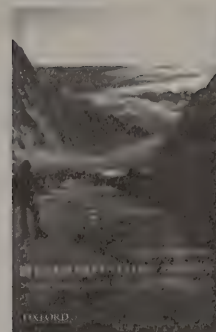
I like Balance Bars, but they don't travel very well. For a real meal I'll take Alpineaire freeze-dried gourmet meals, which offer the best taste and variety of any camping meals and which are even available in a self-heating pouch. (They're used by Navy SEALs and US Forest Service fire crews.) Full meals vary from about \$5.25 to \$7.50 from www.alpineaire.com/ or at many outdoor stores.

GOOD SUNGLASSES ARE ESSENTIAL

I used Julbo wrap-around glacier glasses, from REI at \$59. An altimeter is essential. I used the Suunto Vector altimeter watch with built-in compass, thermometer, and barometer, available at almost any outdoor store for \$199. Also, a hat (mine is a polypro skull cap from North Face, www.thenorthface.com, for \$19, along with a variety of baseball caps) and a good knife or multi-tool (I carry a Kershaw Blizzard spring-loaded folding knife, \$69.95 at REI, and a Leatherman, \$59).

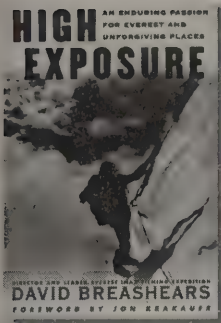
SOME CDS AND A DISC PLAYER

No one should travel to Nepal without taking *Rain of Blessings*, a Real World Records CD featuring the Tibetan Buddhist chants of Lama Gyurme with the keyboard arrangements of French musician Jean-Phillipe Rykiel. A seamless integration of Tibetan chants and haunting contemporary composition. \$26.99 from www.towerrecords.com. —DB



Sagarmatha Sagas

Because you don't carry all your belongings on your back—porters will carry the heavy loads—you have the luxury of taking books to Everest Base Camp. I went a bit overboard, but I needed reference material. These are among the best. —DB



EVEREST
Walt Unsworth
1997; 704 pp.
\$8.50. HarperCollins

The most thorough and readable complete history of Everest expeditions up through 1988.

INTO THIN AIR
Jon Krakauer
1997; 378 pp.
\$7.99. Anchor

A controversial classic and a regrettable film, but it remains one of the best written and, I think, the fairest of the accounts of the tragic spring in 1996 when twelve people died on Everest.

HIGH EXPOSURE
David Breashears
1999; 309 pp.
\$15. Touchstone

By a world-class climber and filmmaker (a rare combination). Thoughtful, candid and honest.

MAN OF EVEREST
THE AUTOBIOGRAPHY OF TENZING NORGAY
James Ramsey Ullman
1955; 319 pp.

The Reprint Society of America
About \$5 at Pilgrims Book House, the best bookstore in Kathmandu.
GET THIS BOOK BACK IN PRINT!

Out of print, but you can almost always find a knock-off version in Kathmandu, where you can find knock-off versions of virtually everything. Rare insight into the mind of the world's most famous Sherpa.

LIFE AND DEATH ON MT. EVEREST
SHERPAS AND HIMALAYA MOUNTAINEERING
Sherry Ortner
1999; 376 pp.
\$24. Oxford University Press

Ortner is an anthropologist, and not a lover of the climbing ethic, but she pre-

sents an exhaustive study of how climbing has changed and been changed by the remarkable Sherpa people.

EVEREST
EXPEDITION TO THE ULTIMATE
Reinhold Messner
1978; 276 pp.
\$24.95. The Mountaineers

Messner is the Michael Jordan of mountaineering. He has done things humans are not supposed to be able to do. He and Peter Habeler were the first to summit Everest without oxygen, and then Messner went back and did it entirely alone.

MOUNT EVEREST NATIONAL PARK
SAGARMATHA, MOTHER OF THE UNIVERSE
Margaret Jefferies
1986, *The Mountaineers*
Out of print; look for a copy at a used bookstore or Internet service.

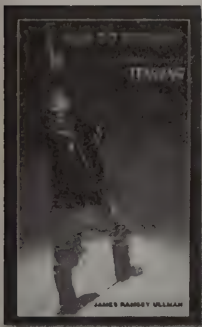
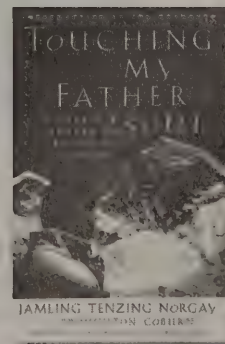
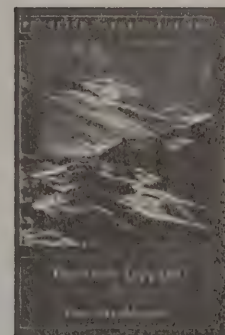
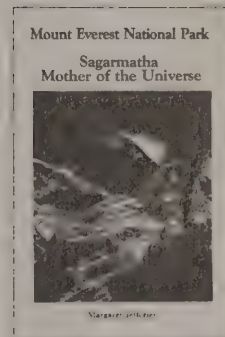
Simply one of the finest guidebooks to Everest and the Khumbu region available.

THE SNOW LEOPARD
Peter Matthiessen
1978; 338 pp.
\$13.95. Penguin Classics

National Book Award classic. Not about Everest, it describes a journey into the remotest corner of Nepal. It traverses the deep and rich corners of Matthiessen's fertile mind. Reading *Snow Leopard* in Nepal adds extra impact.

TOUCHING MY FATHER'S SOUL
A SHERPA'S JOURNEY TO THE TOP OF THE WORLD
Jamling Tenzing Norgay
2001; 316 pp.
\$26. HarperCollins

Written by Tenzing Norgay's son, it's as good an Everest book as I've read, full of personal insights from a Sherpa perspective, with stories no one else has told about his famous father.



THE FIFTEEN PROPERTIES OF



BY CHRISTOPHER ALEXANDER

About twenty years ago, I began to notice that objects and buildings which have life all have certain identifiable structural characteristics. The same geometric features keep showing up in them, again and again. Initially I began writing these characteristics down informally, and I began to “keep watch” on them.

What I did was straightforward and empirical. I simply looked at thousands and thousands of examples, comparing those which had more life with those that had less life. Whenever I looked at two examples, I could determine which one had greater “life” or greater wholeness, by asking which of them generated a greater wholeness in me. Thus, I did not impose on myself the modesty of judgment typical in a pluralistic society. I did not worry about “my” values compared with someone else’s values. I simply identified those examples which had the greater wholeness, judging this by the degree of wholeness they induced in me, and assuming, with as much confidence as I felt to be real and reliable, that what I measured here would also be shared with others.

I asked myself this question: Can we find any structural features which tend to be present in the examples which have more life, and tend to be missing in the ones which have less life? In other words, can we find any recurrent geometrical structural features whose presence in things correlates with their degree of life? To find this out, it is necessary to make thousands and thousands of

comparisons, to ask oneself constantly whether any features can be identified which correlate with the degree of wholeness which things have. This is what I did. For twenty years, I spent two or three hours a day looking at pairs of things—buildings, tiles, stones, windows, carpets, figures, carvings of flowers, paths. Seats, furniture, streets, paintings, fountains, doorways, arches, friezes—comparing them, and asking myself: Which one has more life? And then asking: What are the common features of the examples that have most life?

I managed to identify fifteen structural features which appear again and again in things which do have life. These are: I. LEVELS OF SCALE, 2. STRONG CENTERS, 3. BOUNDARIES, 4. ALTERNATING REPETITION, 5. POSITIVE SPACE, 6. GOOD SHAPE, 7. LOCAL SYMMETRIES, 8. DEEP INTERLOCK AND AMBIGUITY, 9. CONTRAST, 10. GRADIENTS, 11. ROUGHNESS, 12. ECHOES, 13. THE VOID, 14. SIMPLICITY AND INNER CALM, 15. NON-SEPARATENESS.

...The fifteen properties identify the character of living systems. The regions of space which can have this living character vary enormously. If we have a bowl, a picture, a building, a forest, a pathway in a temple, a bay window in a London house—and we see all fifteen properties repeating throughout again and again and again, there is a good chance we have a thing or place whose life is profound. Systems in space which have these fifteen properties to a strong degree will be alive, and the more these properties are present, the more the systems which contain them will tend to be alive.

These include most examples of natural living systems: a clump of grass in a swamp. They may include a medieval illuminated miniature; the window in the wonderful room at the Topkapi palace in Istanbul. They will also include, at a lower level, places or things which have more ordinary life. This may include the terrace outside your favorite gas station, a beer garden outside the Oetzal station in Austria. It may include the seaweed in a tidal flat, even with a few cans and bottles lying there.

If we look at things which have a few of the fifteen properties, less densely packed, and not all of them, we often get some sort of living character, for instance, the stadium at Wrigley Field, a pair of roller skates, a toothbrush.

The things and systems in the world which are most dead—the most image-laden buildings and artifacts, the most sterile housing projects, the most damaged ecological systems, the most poisoned streams—will have these properties to the least degree.

Thus, although these properties define a vast family of possible places and objects and systems, all the members of this family have life in some degree. The properties, taken together, define a rough but graspable family of all those systems and things which have a great deal of life. Thus roughly (and I must emphasize that this is only true to a first approximation), the fifteen properties define the enormous family of systems, among all possible systems, which have life in them.

Excerpted with permission from *The Nature of Order* (see review and access, page 73).

The fact that it is possible to characterize this family at all is surprising. The family which is so defined is very complex morphologically. Superficially, the many examples in this chapter look dissimilar. Each belongs to its own time and place. They vary in culture, climate, and technology. But more deeply, there is a sense in which these different cases all look the same. They all have the same deep quality; one sees the same structure, again and again, throughout the examples.

Thus we have a grip, perhaps for the first time, on the actual physical and geometrical character which living systems have. It is not too much to say that any building which has life in it, must be a recognizable member of this family. Any doorknob which has life, any garden, any garden path, which has life in it, must be a recognizable member of this family.

It should be observed that this fact is not neutral with regard to theories of architecture. One cannot help noticing that the buildings of recent decades (1940–90) are noticeably missing in these properties. I believe that this is intentional, and that various unusual twentieth-century theories of architecture have led architects and designers consciously to move away from these properties in the effort to promulgate some particular

style or intention. For people who have been brainwashed by these recent theories of design, it may be uncomfortable to confront the factual nature of the fifteen properties. I believe this cannot be helped.

It is useful, I think, to make some mention of the dates of manufacture of the artifacts shown as examples. Readers and students have observed that many of these properties belong to ancient artifacts. They ask me, Why don't you give more examples of recently built buildings to illustrate these properties? The sad truth is that the works of the last fifty years have consciously abandoned understanding, or use, of these properties. Such works obviously do not serve well as illustrations except in a bad sense. This does not mean that the fifteen properties have anything to do with ancient things as opposed to modern ones. Many of the examples (positive and negative) are made in the twentieth century. Overall, the dates of the objects range from about 1500 BCE to 1997 CE—a span of some 3,500 years. There is a more or less homogeneous distribution of examples over that very long period. The fact that there are relatively fewer examples to be shown from the last seventy years is not polemical, but merely factual and proportioned.

I first identified these fifteen properties during the years 1966–73. By 1976 these were well defined, and it was clear to me that they occurred repeatedly in those artifacts which have life....

However, in 1976, it was not yet clear to me how to interpret these properties. They were, at that time, only raw products of observation. I knew that these features appeared repeatedly both in great buildings and works of art, and in nature, but I had no clear idea what they meant, or where they came from.

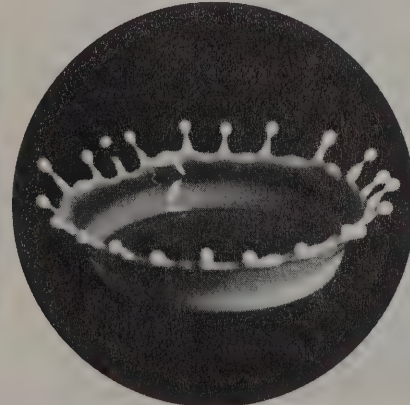
...I began to realize that these fifteen properties were indicators, rough approximations of some deeper structure which looked and felt like "all of them together."

...I finally recognized that it is the field of centers which is primary, not these fifteen properties, and that the properties are simply aspects of the field which help us to understand concretely how the field works.

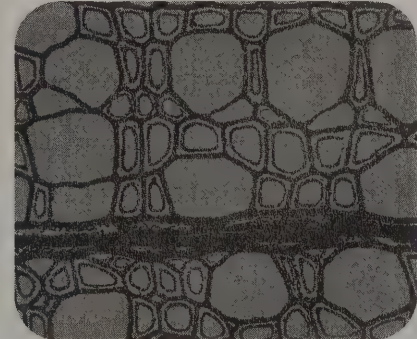
...Simply put, I believe that these properties arise because they are the principal ways in which centers can be strengthened by other centers. They are, if you like, fifteen ways of talking about centers, and the way that the existence and life of centers dominates the existence of life in the world.



1. LEVELS OF SCALE is the way that a strong center is made stronger partly by smaller strong centers contained in it, and partly by its larger strong centers which contain it.

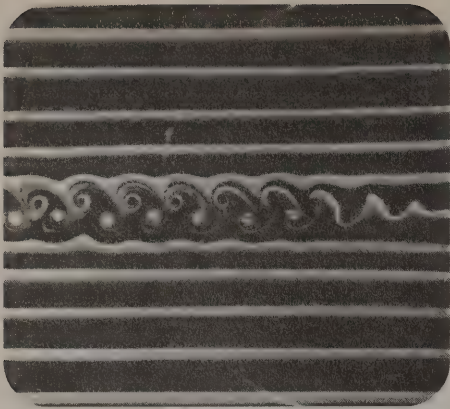


2. STRONG CENTERS defines the way that a strong center requires a spatial field-like effect, created by other centers, as the primary source of its strength.



3. BOUNDARIES is the way in which the field-like effect of a center is strengthened by the creation of a ring-like center, made of smaller centers which surround and intensify the first. The boundary also unites the center with the centers beyond it, thus strengthening it further.

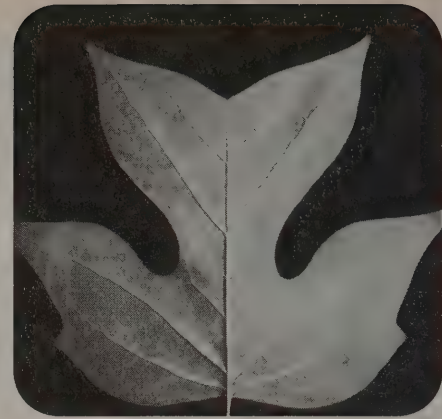
For key to illustrations, see page 73.



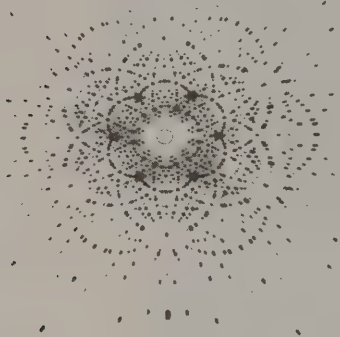
4. ALTERNATING REPETITION is the way in which centers are strengthened when they repeat, by the insertion of other centers between the repeating ones.



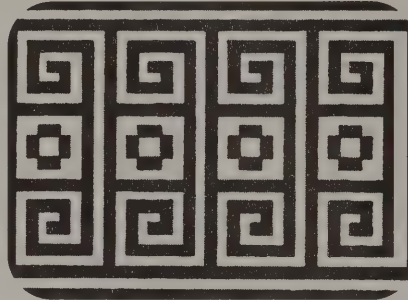
5. POSITIVE SPACE is the way that a given center must draw its strength, in part, from the strength of other centers immediately adjacent to it in space.



6. GOOD SHAPE is the way that the strength of a given center depends on its actual shape, and the way this effect requires that even the shape, its boundary, and the space around it are made up of strong centers.



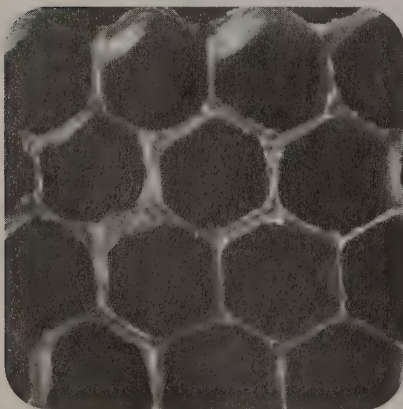
7. LOCAL SYMMETRIES is the way that the intensity of a given center is increased by the extent to which other smaller centers which it contains are themselves arranged in locally symmetrical groups.



8. DEEP INTERLOCK AND AMBIGUITY is the way in which the intensity of a given center can be increased when it is attached to nearby strong centers, through a third set of strong centers that ambiguously belong to both.



9. CONTRAST is the way that a center is strengthened by the sharpness of the distinction between its character and the character of surrounding centers.



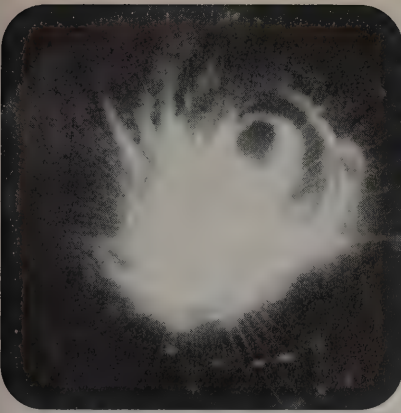
10. ROUGHNESS is the way that the field effect of a given center draws its strength, necessarily, from irregularities in the sizes, shapes, and arrangements of other nearby centers.



11. GRADIENTS is the way a center is strengthened by a graded series of different-sized centers which then "point" to the new center and intensify its field effect.



12. ECHOES is the way that the strength of a given center depends on similarities of angle and orientation and systems of centers forming characteristic angles thus forming larger centers, among the centers it contains.



13. THE VOID is the way that the intensity of every center depends on the existence of a still place—an empty center—somewhere in its field.



14. SIMPLICITY AND INNER CALM is the way the strength of a center depends on its simplicity—on the process of reducing the number of different centers which exist in it, while increasing the strength of these centers to make them weigh more.



15. NON-SEPARATENESS is the way the life and strength of a center is merged smoothly—sometimes even indistinguishably—with the centers that form its surroundings.

Illustration Key

- 1. Colt and mare.
- 2. A milk drop splash.
- 3. Layers of boundaries in wood tissue.
- 4. Mid-span wake of an airfoil.
- 5. Ink and gelatin.
- 6. Tulip tree leaf.
- 7. Scattering from a beryllium atom.
- 8. Greek fret ornament.
- 9. Purple emperor butterfly.
- 10. Cells of a honeycomb.
- 11. Chambered nautilus.
- 12. X-ray of a lily.
- 13. The eye of a storm.
- 14. A desert landscape.
- 15. Edge of a lake.

Nos. 3, 4, 5, 6, 7, 9, 12, 13, 15 from *The Nature of Order*. Nos. 2, 11 from Peter S. Stevens, *Patterns in Nature* (out of print). No. 8 from István Hargittai and Magdolna Hargittai, *Symmetry: A Unifying Concept*.

Christopher Alexander was born in Vienna and educated at Cambridge University and Harvard. He is professor of architecture at the University of California, Berkeley. Since *Whole Earth* reviewed his *Pattern Language* twenty-five years ago, it has remained one of the books readers have repeatedly cited as most influential in their lives. *The Phenomenon of Life* is the first volume of a four-volume, 2,000-page magnum opus to be published over the next several months. See also www.patternlanguage.com for a fuller understanding of the pattern language, examples of its use, and links to Alexander's network. —MKS

The Nature of Order

In *A Pattern Language* Chris Alexander and colleagues answered many problems of the built environment by proposing a large set of connected directives for everyday choices in planning, design, and construction, such as "Vary ceiling heights continuously throughout the building." Although there was some chaff with the wheat, the book attracted thousands of fans and users because it was people-centered, good-hearted, persuasive, and directly usable.

Now *The Nature of Order* meticulously and seductively unfolds a thought tapestry mapping out the unity and life underlying all levels of physical form. To enter this rich fabric is to dive headlong into a vast, hypnotic network of richly ordered centers. The intricate geometry of the oriental carpets he has so intensively studied has given Alexander a lens for studying everything in nature and everything humans build. The result is the direct opposite of a quick series of sound bites!

The idea of wholeness is not new. What is new is for a mathematically trained and humanistic architect to devote decades to rigorously articulating a new vision for seeing and form-making in the physical world. As an architect (and former student of Alexander's), I find it incredibly refreshing to try to weave these ideas into my daily design work and into the evolution of my own little homestead.

Alexander gently educates the eye to see how modern architecture often bulges with ego, technological prowess, and form-making cleverness, but is short on soul, heart, and understanding exactly what makes some buildings and places live more than others. Seeking deep wholeness and life requires transcending the modernist/traditionalist dichotomy to enter into a timeless realm where geometry merges with spirit. I know of no other architectural theoretician, critic, editor, or philosopher offering thought remotely as inspiring, challenging, or comprehensive. —Robert Gay



The Nature of Order
An Essay on the Art of Building and the Nature of the Universe
Book One: The Phenomenon of Life
 Christopher Alexander
 2000; 472 pp.
 \$75
 Oxford University Press

Your Face Is Not a Bar Code

Arguments Against Automatic Face Recognition in Public Places

by Phil Agre

Given a digital image of a person's face, face recognition software matches it against a database of other images. If any of the stored images matches closely enough, the system reports the sighting to its owner. Research on automatic face recognition has been around for decades, but accelerated in the 1990s. Now it is becoming practical, and face recognition systems are being deployed on a large scale.

Some applications of automatic face recognition systems are relatively unobjectionable; for example to regulate access to weapons, money, criminal evidence, nuclear materials, or biohazards. When a citizen has been arrested for probable cause, it is reasonable for the police to use automatic face recognition to match a mug shot of the individual against a database of mug shots of people who have been arrested previously.

Face recognition systems in public places, however, are a matter for serious concern. The issue recently came to broad public attention when it emerged that fans attending the Super Bowl had unknowingly been matched against a database of alleged criminals, and when the city of Tampa deployed a face recognition system in the nightlife district of Ybor City. Current and proposed uses of face recognition are much more widespread. The time to consider the acceptability of face recognition in public places is now, before the practice becomes entrenched and people start getting hurt.

As the underlying information and communication technologies (digital cameras, image databases, processing power, and data communications) become radically cheaper over the next two decades, face recognition will become dramatically cheaper as well, even without assuming major advances in technologies such as image processing that are specific to recognizing faces. Legal constraints on the practice in the United States are



minimal. (In Europe the data protection laws will apply, providing some basic rights of notice and correction.) Databases of identified facial images already exist in large numbers (driver's license and employee ID records, for example), and new facial-image databases will not be hard to construct, with or without the knowledge or consent of the people whose faces are captured. (The images need to be captured under controlled conditions, but most citizens enter controlled, video-monitored spaces such as shops and offices on a regular basis.) Automatic face recognition will grow explosively and become pervasive unless action is taken now.

I believe that automatic face recognition in public places, including commercial spaces such as shopping malls that are open to the public, should be outlawed. The dangers outweigh the benefits. The necessary laws will not be passed, however, without overwhelming pressure of public opinion and organizing.

Arguments against automatic face recognition in public places

- **The potential for abuse is astronomical.** Pervasive automatic face recognition could be used to track individuals wherever they go. Systems operated by different organizations could easily be networked to cooperate in tracking an individual from place to place, whether they know the person's identity or not, and they can share whatever identities they do know. This tracking information could be used for many purposes. At one end of the spectrum, the information could be leaked to criminals who want to understand a prospective victim's travel patterns. Even more insidiously, tracking information can be used to exert social control. Individuals will be less likely to contemplate public activities that offend

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powerful interests if they know that their identity will be captured and relayed to anyone who wants to know.

The information from face recognition systems is easily combined with information from other technologies. Information from face recognition systems is also easily combined with so-called location technologies such as E-911 location tracking in cell phones, further adding to the danger of abuse.

- **Ease of surreptitious use.** Among the many “biometric” identification technologies, face recognition requires the least cooperation from the individual. Automatic fingerprint reading, by contrast, requires an individual to press a finger against a machine. Organizations that have good reasons to identify individuals should employ whatever technology has the least inherent potential for abuse, yet very few identification technologies have more potential for abuse than face recognition.

- **False positives.** The technology is hardly foolproof. Among the potential downsides are false positives, for example that so-and-so was “seen” on a street frequented by drug dealers. Such a report will create “facts” that the individual must explain away. The conditions for image capture and recognition in most public places are far from ideal. Shadows, occlusions, reflections, and multiple uncontrolled light sources all increase the risk of false positives. As the database of facial images grows bigger, the chances of a false match to one of those images grows proportionally larger.

- **Loss of anonymity.** If people could be identified just from looking in a shop window or eating in a restaurant, it would be a tremendous change in our society’s conception of the human person. People would find strangers addressing them by name. Prospective customers walking into a shop could find that their credit reports and other relevant information had already been pulled up and displayed for the sales staff before they even inquire about the goods. Even aside from the privacy invasion that this represents, premature disclosure of this sort of information could affect the customer’s bargaining position. Face recognition devices, moreover, can easily be programmed to recognize facial expressions. It is not just “identity” that can be captured, then, but data that reaches into the person’s psyche.

- **No effective notice.** It is hard to provide effective notice of the capabilities of cameras in most public places, much less obtain meaningful consent. Travel through many public places, for example government offices and centralized transportation facilities, is hardly a matter of choice for any individual wishing to live in the modern world. Even in the private sector, many retail industries (groceries, for example) are highly concentrated, so that consumers have little choice but to submit to the dominant company’s surveillance practices.

- **Political abuse.** If face recognition technologies are pioneered in countries where civil liberties are relatively strong, it becomes more likely that they will also be deployed in countries where civil liberties hardly exist. In twenty years, at current rates of progress, it will be feasible for the Chinese government to use face recognition to track the public movements of everyone in the country.

Arguments in favor of automatic face recognition in public places

- **Only criminals.** “All of the people in our database are wanted criminals. We don’t store any of the images that our cameras capture, except when they match an image in the database. So the only people who have any cause for complaint are criminals.”

The problems with this argument are numerous:

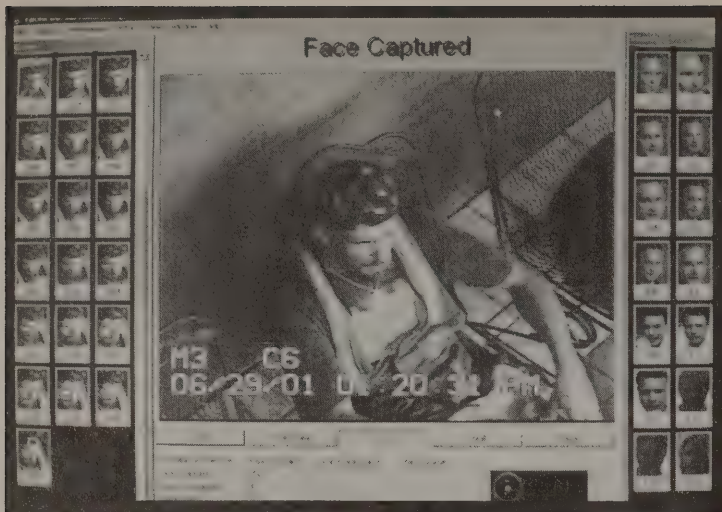
- (1) We have to trust your word that the only people whose images are stored are wanted criminals. We have to trust your word that you throw away all of the images that fail to match the database.

- (2) You don’t really know yourself whether all of the people in the database are criminals. Quality control on those databases is far from perfect, as the database of “felons” that was used to purge some Florida counties’ electoral rolls in 2000 demonstrated.

- (3) Even if the only people in the database today are criminals, the forces pushing us down a slippery slope of ever-expanding databases are nearly overwhelming. Once the system is established and working, why don’t we add alleged troublemakers who have been ejected from businesses in the past but have never been convicted of crimes? Then we could add people with criminal records who have served their time, people who have been convicted of minor offenses such as shoplifting, people with court orders to stay away from certain places, people with court summonses for minor offenses such as unpaid parking tickets, missing persons, children whose parents are worried about them, elders whose children are worried about them, parents who are behind on their child support, employees of the business where the system is operating, and other individuals who have signed contracts agreeing to be tracked. And once those people are added, it is a short step to add many other categories of people.

- **Public is public.** “If someone happens to notice you walking in the park, you have no grounds for complaint if they decide to tell someone else where you were. That’s all we’re doing. You don’t have any reasonable expectation of privacy in a public place.”

In arguing in favor of a ban on automatic face recognition in public places, one is not arguing for a blanket “right of privacy in public,” which would be unreasonable.



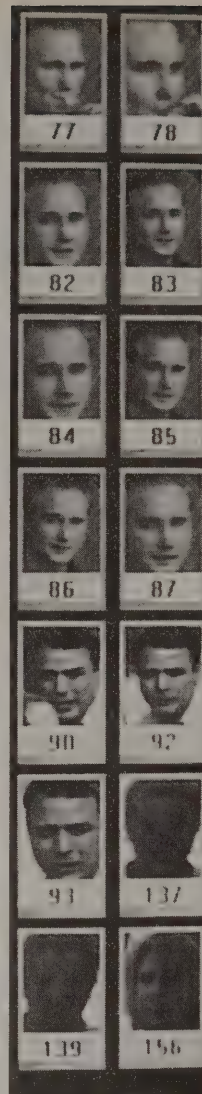
THOMAS GOETHE, ST. PETERSBURG TIMES. USED WITH PERMISSION.

This system compares a camera's image to a computer database of faces of known sex offenders and people wanted by the police. The man in this image was not identified as wanted.

able and impractical. Rather, one is arguing for a right against technologically mediated privacy invasions of certain types. Technological mediation is key because of its continuous operation, standardized results, lack of other legitimate purposes, ease of merging and storing information from different sources, and rapidly dropping costs.

• **Your face already is a bar code.** "What are you talking about? Everyone's face is unique, and people can use your face to recognize you. That's all the technology does."

Well, obviously, to say that your face is not a bar code is first and foremost a moral statement. Your face should not be *treated* as a bar code. But in fact, your face really is not a bar code. When a person sees your face, that is different from a machine reading a bar code because the person who sees your face cannot easily communicate to a third party what the face looks like. That is why the police need skilled interviewers with specialized artistic techniques to recover facial images from eyewitnesses. An automatic face recognition machine, on the other hand, computes a digital representation of your face that is easily communicated, compared, stored, and associated with other information. So the technology does something more than what people do. If several different people spot you in several different locations, then they cannot connect up the different sightings unless they all know your name, or they are all shown a photograph of you, or your appearance is very distinctive in some way. Even then, the effort required to put the different sightings together is considerable. Machines can remember identities in industrial quantities, which people cannot do without special training, and they can assemble data across great distances much more quickly and efficiently than people can. The differences between human and machine face recognition, then, are so extensive that they cannot be treated as interchangeable.



• **Equal transparency.** "The real solution is to make sure that everyone is subject to surveillance. Once society is completely transparent, the powerful won't be able to use technology for repression, because their repressive scheming will be under surveillance too."

This scenario is unrealistic and immoral. The powerful by definition are the ones with the greatest capacity to escape surveillance, and so even in the greatest possible epidemic of surveillance they would be the last to succumb. A regime of total surveillance would itself be extreme repression, and because a large proportion of the population would resist it, it could only be enforced through extreme repression.

• **Just put up a sign.** "Providing proper notice of cameras in public places is easy. In Europe, many public places are plastered with signs that read 'This area monitored by CCTV.' What is the problem?"

The phrase "This area monitored by CCTV" does not properly convey what the cameras can do, much less what will be done with the images that they capture. As cameras and their capabilities

become more diverse, notifications will have to become either more detailed or more vague. Likewise with the expanding range of potential secondary uses.

• **Crime fighting.** "Automatic face recognition stops crime. Police say they want it. By automating some of their more tedious jobs, it will free them to allocate their limited resources more effectively. And if it prevents one child from being killed then I support it."

A free society is a society in which there are limits on what the police can do. If we want to remain a free society then we need to make a decision. Once a new surveillance technology is installed, it is nearly impossible to stop the slippery slope toward ever-broader government use of it.

We should assume from the beginning that any technology that captures personal information will be used for government purposes, and not only in cases where lives are at stake. The potential for abuse should then be figured into our decision about whether the technology should be deployed at all.

It is hardly proven that face recognition stops crime,

when face recognition is being added to a world that already contains many other crime-fighting technologies. Even if one encountered a case where a crime was solved using a given technology it by no means follows that the crime would not have been solved equally well using some other technology. And even if face recognition causes additional crimes to be prevented or solved, that effect should be weighed against the number of additional crimes that abuse of face recognition makes possible.

• **Nothing new.** “The technology doesn’t create anything new. If the government wants to follow you around now, they get plainclothes cops to do it. The technology may make following you cheaper, but it doesn’t make anything possible that wasn’t possible before.”

The argument against automatic face recognition is not that it creates something qualitatively new, but that it amplifies existing dangers, such as political repression, beyond a level that a democracy can tolerate.

• **Commerce.** “Privacy prevents the marketplace from functioning efficiently. When a company knows more about you, it can tailor its offerings more specifically to your needs. The right question is whether people are willing to give up information in exchange for something of value, and most people are.”

What distinguishes automatic face recognition from many other equally good identification technologies is that it can be used without the individual’s permission (and therefore without the individual having agreed to any exchange). That is why it should be banned.

• **Secrecy is bad. “What do you have to hide?”**


This line is used against nearly every attempt to protect personal privacy, and the response in each case is the same. People have lots of valid reasons, personal safety for example, to prevent particular others from knowing particular information about them. Democracy only works if groups can organize and develop their political strategies in seclusion from the government, and from any established interests they might be opposing. This includes, for example, the identities of people who might travel through public places to gather for a private political meeting. In its normal use, the question “What do you have to hide?” stigmatizes all personal autonomy as anti-social. As such it is an authoritarian demand, and has no place in a free society.

• **The civilized world has been attacked by terrorists. We have to defend ourselves.**

“It’s wartime, and we have to give up some civil liberties in order to secure ourselves against the danger.”

We must certainly improve our security in many areas. I have said that myself for years. The fallacy here is in the automatic association between security and restrictions on civil liberties. Security can be improved in many ways, for example by rationalizing identifica-

tion systems for airport employees or training flight attendants in martial arts, without having any effect on civil liberties. Security can be improved in other ways, for example by preventing identity theft or replacing Microsoft products with well-engineered software that greatly improve privacy. And many proposals for improved security, such as searching passengers’ luggage properly, have a minimal effect on privacy relative to existing practices. The “trade-off” between security and civil liberties, therefore, is highly overrated, and I am quite surprised by the speed with which many defenders of freedom have given up any effort to defend the core value of our society as a result of terrorist attacks.

Once we transcend automatic associations, we can think clearly about the choices that face us. Our goal should be to redesign our security arrangements in a way that provides both of the conditions of a free society: security and civil liberties. Among the many security measures we might choose, it seems doubtful that we would choose ones that, like automatic face recognition in public places, carry astronomical dangers for privacy. At least any argument for such technologies requires a high standard of proof. 

For Further Information

Phil’s original article includes about forty URLs to websites with articles and other information on this topic. Here are his recommendations for several that cover the range of issues he addresses:

Facial ID Systems Raising Concerns About Privacy
<http://washingtonpost.com/wp-dyn/articles/A12629-2001jul31.html>

Electronic Privacy Information Center Face Recognition Page
www.epic.org/privacy/facerecognition/

Facing the Truth: A New Tool to Analyze Our Expressions
www.hhmi.org/bulletin/may2001/faces/

The Two Dominant Face Recognition Companies
www.visionics.com/faceit/
www.viisage.com/

Directory of Face Recognition Research
www.cs.rug.nl/~peterkr/FACE/face.html

Super Bowl Surveillance: Facing Up to Biometrics
www.rand.org/publications/IP/IP209/IP209.pdf

Click. BEEP! Face Captured
www.sptimes.com/News/071901/Floridian/Click_BEEP_Face_captu.shtml

Protecting Civilization from the Faces of Terror
<http://www.visionics.com/newsroom/downloads/whitepapers/counterterrorism.pdf>

Phil Agre is an associate professor of information studies at the University of California, Los Angeles. In his review of Phil’s Red Rock Eater News Service (*Whole Earth*, Spring 2000), Howard Rheingold said of Phil, “I’d put him at the top of technology critics who understand and appreciate the subject.” To subscribe to the service, see <http://dlis.gseis.ucla.edu/people/pagre/rre.html>. Much thanks to Kevin Kelly for suggesting Phil’s article to us.

india will not behave

India's Most Unreasonable Author
Tries to Help Us Wake Up

by Arundhati Roy

India lives in several centuries at the same time. Somehow we manage to progress and regress simultaneously. As a nation we age by pushing outward from the middle—adding a few centuries on to either end of our extraordinary c.v. We greatness like the maturing head of a ham-

judgment on this peculiar form of “progress” by suggesting that Modern is Good and Traditional is Bad—or vice versa. What’s hard to reconcile oneself to, both personally and politically, is the schizophrenic nature of it. That applies not just to the ancient/modern conundrum, but to the utter illogic of what appears to be the current national enterprise. In the lane behind my house, every night I walk past road gangs of emaciated laborers digging a trench to lay

then, half a century later, followed that up with nuclear tests is a ferocious burden. To be a writer in a country where something akin to an undeclared civil war is being waged on its subjects in the name of “development” is an onerous responsibility. When it comes to writers and writing, I use words like “onerous” and “responsibility” with a heavy heart and not a small degree of sadness.

A good or great writer may refuse to accept any responsibility or morality that society wishes to impose on her. Yet the best and greatest of them know that if they abuse this hard-won freedom, it can only lead to bad art. There is an intricate web of morality, rigor, and responsibility that art, that writing itself, imposes on a writer. It’s singular, it’s individual, but nevertheless it’s there. At its best, it’s an exquisite bond between the artist and the medium. At its acceptable end, it’s a sort of sensible co-operation. At its worst, it’s a relationship of disrespect and exploitation.

Nowadays in India the [writing] scene is almost farcical. Following the recent commercial success of some Indian authors, Western publishers are desperately prospecting for the next big Indo-Anglian work of fiction. They’re doing everything short of interviewing English-speaking Indians for the post of “writer.” Ambitious middle-class parents who, a few years ago, would only settle for a future in engineering, medicine, or management for their children, now hopefully send them to creative writing schools. People like myself are constantly petitioned by computer



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Medha Patkar (far right) and author Arundhati Roy, (left, in white) with hundreds of others protesting the damming of the Narmada River, one of the holiest rivers in India.

merhead shark with eyes looking in diametrically opposite directions. Germany is considering changing its immigration laws in order to import Indian software engineers. A Naga Sadhu at the Kumbh Mela towed the District Commissioner’s car with his penis while the Commissioner sat in it solemnly with his wife and children.

As Indian citizens we subsist on a regular diet of caste massacres and nuclear tests, mosque breakings and fashion shows, church burnings and expanding cell phone networks, bonded labor and the digital revolution, female infanticide and the Nasdaq crash, husbands who continue to burn their wives for dowry and our delectable stockpile of Miss Worlds. I don’t mean to put a simplistic value

fiber-optic cables to speed up our digital revolution. In the bitter winter cold, they work by the light of a few candles.

Of course India is a microcosm of the world. Of course versions of what happens there happens everywhere. Of course, if you’re willing to look, the parallels are easy to find. The difference in India is only in the scale, the magnitude, and the sheer proximity of the disparity. In India your face is slammed right up against it.

To be a writer—a supposedly “famous” writer—in a country where three hundred million people are illiterate is a dubious honor. To be a writer in a country that gave the world Mahatma Gandhi, that invented the concept of nonviolent resistance, and

Excerpted with permission from *Power Politics*, by Arundhati Roy (see page 81).

companies, watch manufacturers, even media magnates to endorse their products. A boutique owner in Bombay once asked me if he could “display” my book *The God of Small Things* (as if it were an accessory, a bracelet or a pair of earrings) while he filmed me shopping for clothes!

It has been nearly four years now since my first, and so far only, novel, *The God of Small Things*, was published. In the early days I used to be described—introduced—as the author of an almost freakishly “successful” (if I may use so vulgar a term) first book. Nowadays I’m introduced as something of a freak myself. I am apparently what is known in twenty-first-century vernacular as a “writer-activist” (like a sofa-bed.)

Why am I called a “writer-activist” and why—even when it’s used approvingly, admiringly—does that term make me flinch? I’m called a writer-activist because after writing *The God of Small Things* I wrote three political essays: “The End of Imagination,” about India’s nuclear tests, “The Greater Common Good,” about Big Dams and the “development” debate, and “Power Politics: The Reincarnation of Rumpelstiltskin,” about the privatization and corporatization of essential infrastructure like water and electricity. Apart from the building of the temple in Ayodhya, these currently also happen to be the top priorities of the Indian government.

Now, I’ve been wondering why it should be that the person who wrote *The God of Small Things* is called a writer, and the person who wrote the political essays is called an activist? True, *The God of Small Things* is a work of fiction, but it’s no less political than any of my essays. True, the essays are works of nonfiction, but since when did writers forgo the right to write nonfiction?

My thesis—my humble theory, as we say in India—is that I’ve been saddled with this double-barreled appellation, this awful professional label, not because my work is political, but

because in my essays, which are about very contentious issues, I take sides. I take a position. I have a point of view. What’s worse, I make it clear that I think it’s right and moral to take that position, and what’s even worse, I use everything in my power to flagrantly solicit support for that position. Now, for a writer of the twenty-first century, that’s considered a pretty uncool, unsophisticated thing to do. It skates uncomfortably close to the territory occupied by political party ideologues—a breed of people that the world has learned (quite rightly) to mistrust. I’m aware of this. I’m all for being circumspect. I’m all for discretion, prudence, tentativeness, subtlety, ambiguity, complexity. I love the unanswered question, the unresolved story, the unclimbed mountain, the tender shard of an incomplete dream. Most of the time.

But is it mandatory for a writer to be ambiguous about everything? Isn’t it true that there have been fearful episodes in human history when prudence and discretion would have just been euphemisms for pusillanimity? When caution was actually cowardice? When sophistication was disguised as decadence? When circumspection was really a kind of espousal?

Isn’t it true, or at least theoretically possible, that there are times in the life of a people or a nation when the political climate demands that we—

even the most sophisticated of us—overtly take sides? I believe that such times are upon us. And I believe that in the coming years intellectuals and artists in India will be called upon to take sides.

BARBARIC DISPOSSESSION AND GLOBALIZATION

Fifty years after independence, India is still struggling with the legacy of colonialism, still flinching from the “cultural insult.” As citizens we’re still caught up in the business of “disproving” the white world’s definition of us. Intellectually and emotionally, we have just begun to grapple with communal and caste politics that threaten to tear our society apart. But in the meanwhile, something new looms on our horizon.

It’s not war, it’s not genocide, it’s not ethnic cleansing, it’s not a famine or an epidemic. On the face of it, it’s just ordinary, day-to-day business. It lacks the drama, the large-format, epic magnificence of war or genocide or famine. It’s dull in comparison. It makes bad TV. It has to do with boring things like jobs, money, water supply, electricity, irrigation. But it also has to do with a process of barbaric dispossession on a scale that has few parallels in history. I’m talking about the modern version of globalization.

Is globalization about the “eradication of world poverty,” or is it a mutant



Dam protester refuses to leave the Narmada River even as the water rises up to his chin and threatens to drown him. (Police later removed him.)

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variety of colonialism, remote controlled and digitally operated?

These are huge contentious questions. The answers vary depending on whether they come from the villages and fields of rural India, from the slums and shantytowns of urban India, from the living rooms of the burgeoning middle class, or from the boardrooms of the big business houses.

Developed countries like the United States, whose hugely subsidized farm industry engages only two to three percent of its total population, are using the WTO to pressure countries like India to drop agricultural subsidies in order to make the market “competitive.”

In effect, India’s rural economy, which supports seven hundred million people, is being garroted. Farmers who produce too much are in distress, farmers who produce too little are in distress, and landless agricultural laborers are out of work as big estates and farms lay off their workers. They’re all flocking to the cities in search of employment.

In India, in order to clear the way for “development projects,” the government is in the process of amending the present Land Acquisition Act (which, ironically, was drafted by the British in the nineteenth century) and making it more draconian than it already is. State governments are preparing to ratify “anti-terrorist” laws so that those who oppose development projects (in Madhya Pradesh, for example) will be counted as terrorists. They can be held without trial for three years. They can have their lands and cattle seized.

Recently, globalization has come in for some criticism. The protests in Seattle and Prague will go down in history. Each time the WTO or the World Economic Forum wants to have a meeting, ministers have to barricade themselves with thousands of heavily armed police. Still, all its admirers, from Bill Clinton, Kofi Annan, and A.B. Vajpayee (the Indian prime minister) to the cheering brokers in the stalls, continue to say the same lofty things. If we have the right institutions of governance in place—effective courts, good laws, honest politicians, participatory democracy,



Women police dragging the women who had gathered to protest the Narmada dam. When the protestors refused to leave, hundreds were arrested.

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a transparent administration that respects human rights and gives people a say in decisions that affect our lives—then the globalization project will work for the poor, as well. They call this “globalization with a human face.”

The point is, if all this were in place, almost anything, would succeed: socialism, capitalism, you name it. Everything works in Paradise, a Communist State as well as a Military Dictatorship. But in an imperfect world, is it globalization that’s going to bring us all this bounty? Is that what’s happening in India now that it’s on the fast track to the free market? Does any one thing on that lofty list apply to life in India today?

TRANSPARENT, ACCOUNTABLE DEMOCRACY?

On October 18, 2000 in one of the most extraordinary legal decisions in post-independence India, the Supreme Court permitted the construction of the Sardar Sarovar Dam on the Narmada River to proceed. The court did this despite indisputable evidence placed before it that the Sardar Sarovar Project did not have the mandatory environmental clearance from the central government. Despite the fact that no comprehensive studies have ever been done

on the social and ecological impact of the dam. Despite the fact that in the last fifteen years not one single village has been resettled according to the project’s own guidelines, and that there was no possibility of rehabilitating the four hundred thousand people who would be displaced by the project. In effect, the Supreme Court has virtually endorsed the violation of human rights to life and livelihood.

Big dams in India have displaced not hundreds, not thousands, but millions—more than thirty million people in the last fifty years. Almost half of them are Dalit and Adivasi, the poorest of the poor. Yet India is the only country in the world that refused permission to the World Commission on Dams to hold a public hearing. The government in Gujarat, the state in which the Sardar Sarovar Dam is being built, threatened members of the commission with arrest. The World Commission on Dams report was released by Nelson Mandela in November 2000. In February 2001, the Indian government formally rejected the report. Does this sound like a transparent, accountable, participatory democracy?

There are huge political and social upheavals that are convulsing the nation. One is not involved by virtue of being a writer or an activist. One is involved because one is a human being. Writing about it just happens to be the most effective thing I can do. I think it’s vital to de-professionalize the public debate on matters that vitally affect the lives of ordinary people. It’s time to snatch our futures back from the “experts.” Time to ask, in ordinary language, the public question and to demand, in ordinary language, the public answer.

The Supreme Court’s reaction to my essay “The Greater Common Good,” was published in May 1999. In July and August of that year, the monsoon waters rose in the Narmada and submerged villages. While villagers stood in their homes for days together in chest-deep water to protest against the dam, while their crops were submerged, and while the NBA—Narmada Bachao Andolan,

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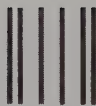
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the people's movement in the Narmada Valley—pointed out (citing specific instances) that government officials had committed perjury by signing false affidavits claiming that resettlement had been carried out when it hadn't, the three-judge bench in the Supreme Court met over three sessions. The only subject they discussed was whether or not the dignity of the court had been undermined. To assist them in their deliberations, they appointed what is called an *amicus curiae* (friend of the court) to advise them about whether or not they should initiate criminal proceedings against the NBA and me for contempt of court. The thing to keep in mind is, while the NBA was the petitioner, I was (and hopefully still am) an independent citizen. I wasn't present in court, but I was told that the three-judge bench ranted and raved and referred to me as "that woman."

On October 15, 1999, they issued an elaborate order. Here's an extract:

Judicial process and institution cannot be permitted to be scandalised or subjected to contumacious violation in such a blatant manner in which it has been done by her [Arundhati Roy]...vicious stultification and vulgar debunking cannot be permitted to pollute the stream of justice...we are unhappy at the way in which the leaders of NBA and Ms. Arundhati Roy have attempted to undermine the dignity of the Court. We expected better behaviour from them....After giving this matter thoughtful consideration...we are not inclined to initiate contempt proceedings against petitioners, its leaders or Arundhati Roy....after the 22nd of July 99...nothing has come to our notice which may show that Ms. Arundhati Roy has continued with the objectionable writings insofar as the judiciary is concerned. She may have by now realised her mistake...

What's dissent without a few good insults?

Anyway, eventually, as you can see, they let me off. And I continued with my Objectionable Writings. I hope in the course of this lecture I've managed to

inspire at least some to embark on careers as Vicious Stultifiers and Vulgar Debunkers. We could do with a few more of those.

On the whole, in India, the prognosis is—to put it mildly—Not Good. And yet one cannot help but marvel at the fantastic range and depth and wisdom of the hundreds of people's resistance movements all over the country. They're being beaten down, but they simply refuse to lie down and die.


We have the maverick Malayi professor who petitions the president every day against the communalization of history texts. Sunderlal Bahugana, who risks his life on indefinite hunger strikes protesting the Tehri Dam, the Adivasis in Jadugoda protesting uranium mining on their lands, the Koel Karo Sanghathan resisting a mega-dam project in Jharkhand, the awe-inspiring Chatisgarh Mukti Morcha, the relentlessly dogged Mazdoor Kisan Shakti Sangathan, the Beej Bachao Andolan in Tehri-Garhwal fighting to save biodiversity of seeds, and of course, the Narmada Bachao Andolan, the people's movement in the Narmada Valley.

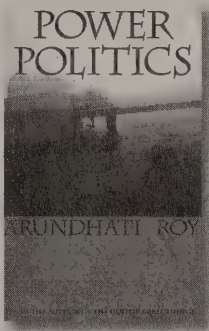
India's redemption lies in the inherent anarchy and factiousness of its people, and in the legendary inefficiency of the Indian state. Even our heel-clicking, boot-stamping Hindu fascists are undisciplined to the point of being chaotic. They can't bring themselves to agree with each other for more than five minutes at a time. Corporatizing India is like trying to impose an iron grid on a heaving ocean and forcing it to behave.

My guess is that India will not behave. It cannot. It's too old and too clever to be made to jump through the hoops all over again. It's too diverse, too grand, too feral, and—eventually, I hope—too democratic to be lobotomized into believing in one single idea, which is, ultimately, what globalization really is: Life Is Profit.

What is happening to the world lies, at the moment, just outside the realm of common human understanding. It is the writers, the poets, the artists, the singers, the filmmakers who can make the connections, who can find ways of

bringing it into the realm of common understanding. Who can translate cash-flow charts and scintillating boardroom speeches into real stories about real people with real lives. Stories about what it's like to lose your home, your land, your job, your dignity, your past, and your future to an invisible force. To someone or something you can't see. You can't hate. You can't even imagine.

Cynics say that real life is a choice between the failed revolution and the shabby deal. I don't know...maybe they're right. But even they should know that there's no limit to just how shabby that shabby deal can be. What we need to search for and find, what we need to hone and perfect into a magnificent, shining thing, is a new kind of politics. Not the politics of governance, but the politics of resistance. The politics of opposition. The politics of forcing accountability. The politics of slowing things down. The politics of joining hands across the world and preventing certain destruction. In the present circumstances, I'd say that the only thing worth globalizing is dissent. It's India's best export. 



Power Politics

Arundhati Roy
2001; 132 pp.
\$12
South End Press,
7 Brookline Street, #1,
Cambridge, MA 02139.
800/533-8478,
www.southendpress.org

Power Politics and Arundhati Roy's previous book, The Cost of Living (1999; Modern Library) are India's gift to the struggle as to whether there should be a corporatized world. No one can parse the movement more succinctly or tellingly. No work unmasks the Pharisees of money-led development more achingly. If she continues to upset the globalization apple cart like a Tom Paine pamphleteer, she will either be greatly honored or thrown in jail.

A call to all writers and artists to participate in the critical issues of our age. Give it to teenagers. Change their world. —Paul Hawken

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

In the name of Allah, the most Benevolent and the Most Merciful. May this memo find you in the shade of Islam enjoying the mercy, the protection, and the grace of Allah.

I write with the explicit purpose of inviting you to lead the American Muslim community in soul searching, reflection, and reassessment.

What happened on Sept. 11 will forever remain a horrible scar on the history of Islam and humanity. No matter how much we condemn it, and point to the Quran and the Sunnah to argue that Islam forbids the killing of innocent people, the fact remains that the perpetrators of this crime against humanity have indicated that their actions are sanctioned by Islamic values.

Muslims have been practicing hypocrisy on a grand scale. They protest against the discriminatory practices of Israel, but are silent against the discriminatory practices in Muslim states. While acknowledging Israeli ill treatment of Palestinians, I must remind you that Israel treats its one million Arab citizens with greater respect and dignity than most Arab nations treat their own citizens.

Today, Palestinian refugees can settle and become citizens of the United States—but in spite of all the tall rhetoric of the Arab world and Quranic injunctions (24:22), no Muslim country except Jordan extends this support to them.

Have we ever demanded international intervention or retribution against Saddam [Hussein] for gassing Muslim Kurds, against Pakistan for slaughtering Muslim Bengalis, against Saudis for abusing the Shiis, against Syria for the massacre at Hama?

We are all eager to condemn Israel; not because we care for rights and lives of the Palestinians, we don't. We condemn Israel because we hate "them."

As an Indian Muslim, I know for sure that nowhere on earth, including India, will I get the same sense of dignity and respect that I have received in the United States. If what happened on September 11th had happened in India, the biggest democracy, thousands of Muslims would have been slaughtered in riots on mere suspicion and there would be another slaughter after confirmation. But in the US, bigotry and xenophobia has been kept in check by media and leaders. In many places hundreds of Americans have gathered around Islamic centers in symbolic gestures of protection and embrace of American Muslims. In many cities Christian congregations have started wearing *hijab* to identify with fellow Muslim

women. In patience and in tolerance ordinary Americans have demonstrated their extraordinary virtues.

It is time that we acknowledge that the freedoms we enjoy in America are more desirable to us than superficial solidarity with the Muslim World.

We have always found a way to reconcile the vast distance between Islamic values and Muslim practices by pointing to injustices done by others. But the point is this—our commitment to Islamic values is not contingent on the moral conduct of the United States or Israel.

The culture of hate and killing is tearing away at the moral fabric of Muslim society. In pursuit of the inferior jihad, we have sacrificed the superior jihad.

It is time that we faced these hypocritical practices and struggled to transcend them. It is time that American Muslim leaders fought to purify their own lot.

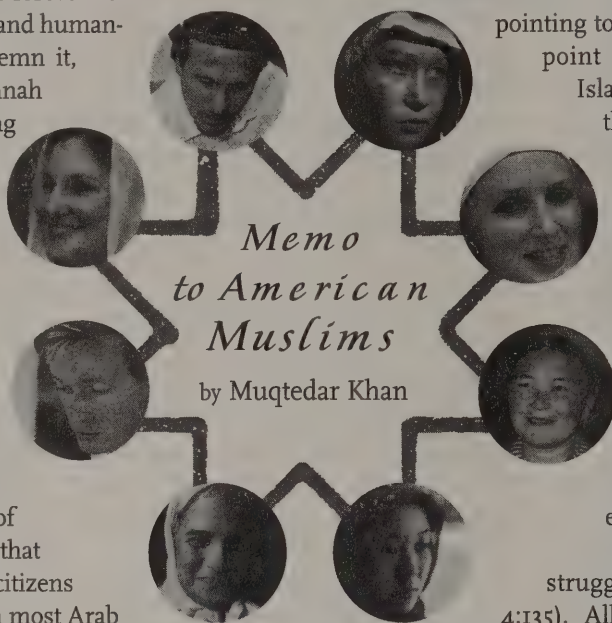
While encouraging Muslims to struggle against injustice (Al Quran 4:135), Allah also imposes strict rules of engagement. He says in unequivocal terms that to kill an innocent being is like killing all humanity (Al Quran 5:32). He also encourages Muslims to forgive Jews and Christians if they have committed injustices against us (Al Quran 2:109, 3:159, 5:85).

Islam has been hijacked by hate and calls for murder and mayhem. If bin Laden were an individual, then we would have no problem. But bin Laden has become a phenomenon—a cancer eating away at our moral foundations. Yes, the United States has played a hand in the creation of bin Laden, but it is we Muslims who have allowed bin Laden and the Taliban to grow and gain such a foothold. It is our duty to police our world. It is our responsibility to prevent people from abusing Islam. We should have made sure the Sept. 11 attacks had never happened.

Islam is not about defeating Jews or conquering Jerusalem or competing with the American Jewish lobby for power over US foreign policy. It is about mercy, about virtue, about sacrifice and about duty. Above all, it is the pursuit of moral perfection.

The worst exhibition of Islam happened on our turf. We must take first responsibility to undo the evil it has manifested. This is our mandate, our burden and also our opportunity.

Suggested by Peter Coyote. Muqtedar Khan is director of the International Studies Program at Adrian College. He earned his Ph.D. in international relations, political philosophy, and Islamic political thought from Georgetown University. His column has appeared in the *San Francisco Chronicle* and the *Detroit Free Press*.



Nonviolent Soldier of Islam

Perhaps no time is more apt than now to study the life of Abdul Ghaffar Khan. ("Badshah," or "King" was an honorific that he bore much as Gandhi did "Mahatma.") Khan was one of the great leaders of the South Asian nonviolent liberation movement. Unlike Gandhi and most of his followers, he was Muslim. Moreover, Khan—"the Frontier Gandhi"—came from northwest India (now Pakistan), where he was raised in the same Pathan warrior culture that gave birth to the Taliban. His application of warrior steadfastness to a nonviolent struggle without retreat or retaliation helped bring independence, but led him to years of exile in Afghanistan and often to jail in both India and Pakistan. In 1962, at the age of 72, he was designated Amnesty International's Prisoner of the Year. Twenty years later, at 93, he was still being arrested (eight years after being released from prison "in consideration of old age"). When he died in 1988, the factions in the Afghan civil war all observed a cease-fire in his honor. —MKS, with Vijaya Nagarajan

"There is nothing surprising in a Muslim or a Pathan like me subscribing to the creed of non-violence. It is not a new creed. It was followed fourteen hundred years ago by the Prophet all the time he was in Mecca, and it has since been followed by all those who wanted to throw off an oppressor's yoke. But we had so far forgotten it that when Gandhiji placed it before us, we thought he was sponsoring a novel creed.



Khan and Gandhi in 1938, when Khan invited Gandhi to tour the northwest frontier.

"Soldiers! Khan liked the idea. Plenty of Pathans were fighters, but those who actually went to join an army fought only for the Raj. Perhaps they did need more soldiers—but certainly not more violence.

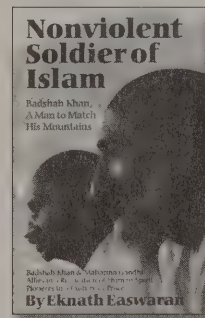
An idea slipped out, as formless at first as the faint shadows of the courtyard around them in the early rays of dawn. An army of nonviolent soldiers, drilled and disciplined, with officers, cadres, uniforms, a flag—perhaps even a drum and bagpipe corps like the Guides! And pledged to fight—not with guns but with their lives.

As far as Khan knew, it had never been done. An army of trained professional nonviolent soldiers was something new.

The young man looked at the badshah. But Pathans? An army of unarmed Pathans?

"Who else?" Khan shot back. Who else but a

Pathan would be reckless enough to try it? What could possibly take more bravado than facing an enemy in a righteous cause without weapons, neither retreating nor retaliating? It was the loftiest kind of honor.



Nonviolent Soldier of Islam Badshah Khan, A Man to Match His Mountains

Eknath Easwaran
1999 (2nd ed.); 274 pp.
\$13.95
Nilgiri Press
PO Box 256,
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Islam

We pride ourselves on the times we've been ten to fifteen years ahead of cultural trends. In 1985, guest editor Jay Kinney produced this special issue, which is as valuable now as it was then: "Islam as Other," "Salat: The Muslim Postures of Prayer," "An Economy without Interest," "Women in Islam," "The Case for Covering Up," and more. A majority of the articles were written by Muslims. The issue itself is endangered—just a few copies left. We'll part with a copy of the issue for \$50, but we'll also send you a bound photocopy of the "Islam" section for \$5, our cost. Give a copy to anyone in need of a timely introduction to one of the world's fastest-growing and most misunderstood religions. —MKS

"Once in the time of the Caliph Omar, a man was brought before the Caliph for theft. In the process of questioning, it was learned that this man had been stealing to provide food for his family. When asked about his livelihood, the man explained that his wages were not enough

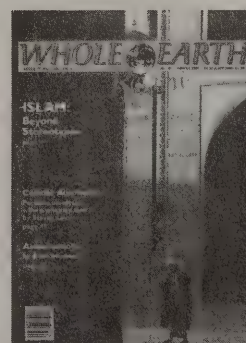
to provide food for his family. Convinced of the man's honesty, the Caliph sent for his employer who was given this warning: If this man were again forced to steal to meet his need, it might be the employer's hand that would be struck off. —EDMUND HELMINSKI, "ISLAM: BLIND SPOT OF THE WEST"

"A woman in the West is nothing more than a sexual object and is only there for the desires of men. The western women should realize this by just looking at the clothes that are designed for them to wear every year. They are not designed for practical use. Dresses that are skin-tight and have hardly any material to them are only to attract the male gender. Western women believe unless they dress like this, they will become spinsters and that no man will seek their acquaintance. They forget they have a personality and a spiritual side to their lives.

...So women who wear *hijab* do not wear it because they are weak. They wear it for they know the high status Allah has given them and

they also wish to protect their society and stop the existence of immorality. They do not wish to be demoralized.

...So the question is not why Muslim women wear *hijab*, but why the women in the West, who think they are so liberated, do not wear *hijab*? —"THE CASE FOR COVERING UP: AN IRANIAN DEFENSE OF HIJAB"



Islam Beyond Stereotypes

Whole Earth
Review No. 49,
Winter 1985
38 pp. bound
photocopy, with
color cover
\$5 postpaid
Whole Earth,
1408 Mission
Avenue,
San Rafael,
CA 94901

The Council on American-Islamic Relations (CAIR)

Long before September 11, CAIR was working to counter misrepresentations of Islam in America, present Islamic perspectives on current issues, and combat discrimination against Muslims. They're particularly savvy about media relations and keeping journalists alerted to discrimination and the misunderstandings or misstatements of government officials and their staffs.

They've produced a helpful series of pamphlets for employers, educators, and health care providers. The pamphlets, available from CAIR for \$3, include brief overviews of Islamic practices, applicable US laws, and suggestions for responding to likely situations.

CAIR also publishes an annual report, "The Status of Civil Rights in the United States" (downloadable from its website) that documents complaints it receives about denials of human and constitutional rights. Most individual incidents aren't dramatic, but they add up, in a pattern of refusals by some Americans to let other Americans go about their daily lives while being different. The 2001 report (for the year 2000) listed 366 complaints, an increase of 15 percent over 1999. (In the first six weeks after September 11, CAIR logged 959 "anti-Islam incidents," including threats and attacks on people and property as well as allegations of discrimination.) —MKS

"During prayer time, the Muslim is fully engaged. He or she may not respond to a ringing telephone or conversation. Fellow employees should not take offense if the worshipper does not answer their call during the prayer. However, in case of emergency, the Muslim will respond to an announcement by stopping the prayer immediately.

Retail employment shifts from 10 A.M. to 6 P.M. (or 11 A.M. to 8 P.M.) imply that Muslim store employees may need to perform noon, afternoon and sunset prayer in the workplace in some states, especially during the winter months. —AN EMPLOYER'S GUIDE TO ISLAMIC RELIGIOUS PRACTICES

"9/5/00: General Foam Plastics Corporation—Norfolk, VA

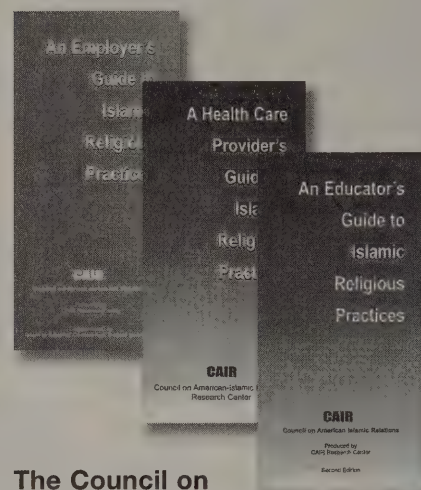
A supervisor interviewing people waiting in line looked at an applicant with *kufi* and told him that there were no job openings. The man reported that when he went back in line and took off his *kufi*, he was offered a job.

8/29/00: Brooks Brothers—Jersey City, NJ

A man of Moroccan origin was allegedly fired without any warning from his boss....He reported being called "camel boy" and claimed he was denied time to observe Ramadan prayers. His boss told him, "This isn't f— Morocco—there is no religion here."

9/1/00: Lynbrook High School—Lynbrook, NY

A ninth grader believed it would violate her faith to exercise with boys in gym class. The school reportedly would allow her to take an aerobics class instead, but only if that was based on a medical reason. —THE STATUS OF CIVIL RIGHTS IN THE UNITED STATES 2001



The Council on American-Islamic Relations (CAIR)

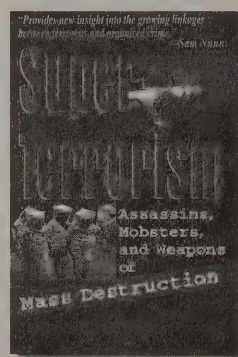
\$30 annual membership includes subscription to quarterly newsletter, "Faith in Action"
453 New Jersey Avenue SE, Washington, DC 20003. 202/488-8787, www.cair-net.org

Superterrorism

Perhaps it's just my long-running suspicion of government power in general, but I've tended to resist getting too worked up over the years by scare stories about terrorist threats. I've had better things to worry about than nuclear bombs in suitcases, and besides, I've been more than a little annoyed by how often my belt buckle seems to set off overly sensitive security detectors at airports.

Hence, I was initially inclined to dismiss a book with a title like *Superterrorism: Assassins, Mobsters, and Weapons of Mass Destruction*, as just more propaganda for expanded police powers. Not so. Glenn Schweitzer soberly surveys the growing overlapping of terrorism among radicals, drug runners, mafiosi, and fringe sects, and offers both copious examples of past incidents and realistic projections of future possibilities. Perhaps it is just the sheer accumulation of details at work, but I came away from this book with the unhappy realiza-

tion that things are likely to get worse before they get better. —Jay Kinney [reviewed in *Whole Earth*, Fall 2000]

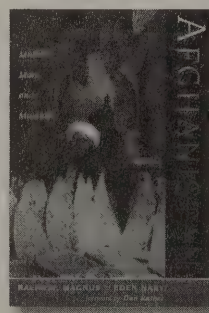


Superterrorism Assassins, Mobsters, and Weapons of Mass Destruction

Glenn E. Schweitzer with Carole C. Dorsch
1998; 363 pp. \$28.95
Plenum

Afghanistan

I think this book is superb; it's more organized and well-written than anything we have in post-Soviet studies. An up-to-date history. —Eric Sievers [Reviewed in *Whole Earth*, Fall 1998]



Afghanistan Mullah, Marx, and Mujahid

Ralph H. Magnis and Edén Naby
1998; 274 pp.
\$30
Westview

Birth of the Chaordic Age

What do the Internet, Alcoholics Anonymous, and VISA International, the organization that brings us the VISA card, have in common?

You can find them just about anywhere on earth. They have not spread through unrelenting market push, like Coca-Cola. Rather they are pulled by demand, because they meet real needs very effectively. They serve their purposes successfully without any obvious headquarters, no glittering center of power, no centralized command. No one owns any of them. VISA does \$1.25 trillion worth of business a year, but you can't buy a share of it.

Dee Hock, who founded VISA, would say these organizations are all "chaordic"—a word he made up by combining "chaos" and "order." They are self-organizing and self-governing. They operate not through hierarchies of authority, but through networks of equals. It isn't power or coercion that makes them effective; rather it's clear shared purpose, ethical operating principles, and responsibility distributed through every node.

By now we take credit cards for granted. It's worth imagining for a moment the network of organizations and the flow of information that allows all those purchases to be billed correctly

to all those customers with all those banks guaranteeing that all those merchants will be paid, in any currency, anywhere in the world. What holds it together is a set of principles (merchants don't pad the bill, banks don't withhold payments, customers pay up) and above all a purpose.

The purpose is "what ought to be." Hock says it's the hard part of any chaordic alliance, getting the purpose right, making it consistent with real need, with the laws of the planet, with the mysteries of life. Purpose is derived from morality, from vision, from collective wisdom, not from individual ambition or greed. That, says Hock, is where the whole industrial system, including both corporations and governments, has gotten so far off track.

Read the book. You might come out seeing a new vision of human organizations that actually works, in a nonhierarchical, self-organizing, adaptive way, to fill real human needs in a way that honors, protects, and learns from the planetary systems that evolved us.

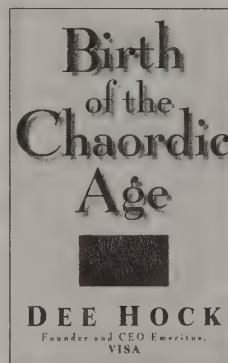
—Donella Meadows

"At the time did I think it could be done? No! It was impossible. Did I think the Bank of America would give up ownership? No! Did I

think banks worldwide could be brought together in such an effort? No! Did I think laws would allow it? No! But did I believe it was what ought to be? Ah, that was another question indeed!

"Heaven is purpose, principle, and people. Purgatory is paper and procedure. Hell is rules and regulations.

"Money, markets, and measurement have their place. They are important tools indeed. We should honor them and use them. But they are far short of the deification their apostles demand of us, and before which we too readily sink to our knees. Only fools worship their tools.



Birth of the Chaordic Age

Dee Hock
1999; 345 pp.
\$27.95
Berrett-Kohler

When Genius Failed

This compelling book is the story of some guys who really needed to do scenario planning. One trillion dollars almost went down with Long-Term Capital Management (LTCM), a hedge fund that was created by the best minds on Wall Street (not to mention a pair of future Nobel Laureates). The principals were extremely successful and respected—they knew what they were doing. Yet their overdependence on financial models, exacerbated by overconfidence, blinded them to a cascade of loan defaults that came close to collapsing the US financial system.

If the financial establishment—coerced at the eleventh hour by the New York Federal Reserve—had not acted together to rescue the company when its elaborate "sure-fire methods" failed, they would likely have unleashed an unprecedented national and global financial crisis.

LTCM could have survived, except that greed got in the way. Flush by their early successes, the principals returned their investors' money so that they could keep all the gains themselves.

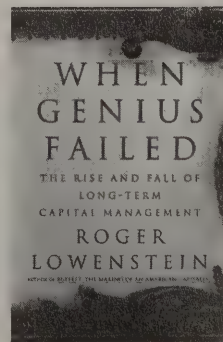
With those [investor] funds, LTCM might have weathered the crisis. —Peter Schwartz (courtesy Global Business Network)

"This one obscure arbitrage fund had amassed an amazing \$100 billion in assets, virtually all of it borrowed—borrowed, that is, from the bankers at [New York Fed President] McDonough's table. As monstrous as this indebtedness was, it was by no means the worst of Long-Term's problems. The fund had entered into thousands of derivative contracts, which had endlessly entwined it with every bank on Wall Street. These contracts, essentially side bets on market prices, covered an astronomical sum—more than \$1 trillion worth of exposure.

"One can be big (and therefore illiquid); one can (within prudent levels) be leveraged. But the investor who is highly leveraged and illiquid is playing Russian roulette, for he must be right about the market not only at the end, but every single day. (One wrong day, and he is out of business.) Long-Term was so self-certain as to believe that the markets would never—not even for a wild swing some August or September—

stray so far from its predictions.

...The professors' conceit was to think that models could forecast the limits of behavior. In fact, the models could tell them what was reasonable or what was predictable based on the past. The professors overlooked the fact that people, traders included, are not always reasonable. This is the true lesson of Long-Term's demise. No matter what the models say, traders are not machines guided by silicon; they are impressionable and imitative; they run in flocks and retreat in hordes.



When Genius Failed
The Rise and Fall of Long-Term Capital Management
Roger Lowenstein
2000; 264 pp.
\$26.95
Random House

Hot Clam!

by Cal Polk

My brother Cal has been shellfishing (oyster-ing, lobstering, clamming) off the north shore harbors of Long Island, New York since he was sixteen. He is a young member of a dying breed of baymen who feel more at home on water than on land, hear the ocean in their heads, and carry the smell of the sea in their bones. Here's part of a letter he recently wrote me:

Today we went clamming. Just got back caught 1,600 neck and 300 big. That's average but it was thundering and lightning all day, which is scary when you are using metal poles. But I love being outdoors, away from the public, with nature, freedom, sunsets, and money at the end of the day, the ride in, and the smell of saltwater. I remember when I bought my first clam boat for \$150 from a friend. The boat leaked and the motor smoked, but I made money and then got a nicer boat with a hard deck and it was self-bailing. Jesse helped me get going with equipment and taught me a few things. We would tie up and eat lunch together and after work go surfing. Those were the good times. It's funny every time I say I am not going to work the water, I always find myself back doing it....

We asked Cal to recommend and review the best books, videos, and website about the clamming life. —EP

Bayman
Cal Polk
at work.



CAL POLK

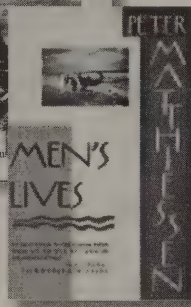
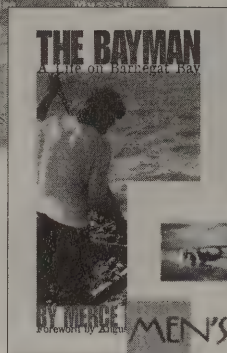
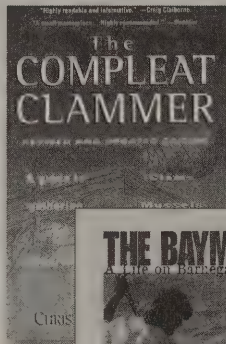
Men's Lives The Surfmens and Baymen of the South Fork

Peter Matthiessen
1988; 335 pp.
\$15
Vintage

Great book about fisherman on the southern fork of Long Island. Many pictures show what baymen do. Talks about the struggles baymen have and the ways they value independence and freedom to work whenever



Seed clams.



they want. These men have never bothered anyone or taken anything that is not theirs. They just want to be alone while making an honest day's pay.

The Bayman A Life on Barnegat Bay

Merce Ridgway
2000; 222 pp.
\$24.95
Down the Shore Publishing
www.down-the-shore.com

A diary of a Barnegat bayman's life. Learn how to catch a clam, process scallops, and avoid being pinched by crabs through the hot summers and while cutting through ice during the cold winters. It's moving without being too sentimental; a story of one fisherman's life as he watches the decline of the industry and the destruction of the natural environment in which it once thrived.

The Compleat Clammer

Christopher Russell Reaske
1999; 176 pp.
\$14.95
Burford Books
www.burfordbooks.com

The classic handbook on how to gather and prepare clams, written by one of the most passionate, lyrical clammers alive. Anybody who reads this book will fall in love with the gathering and preparing of shellfish. A great chapter about clam trivia will nicely wrap up any last questions you may have, such as the lifespan of a clam; the largest pearl ever found; or whether the clam or the scallop reaches sexual maturity first.

“ I tapped the rocky, sandy mud with my spade and felt squirts of water hit my legs as buried steamers responded to my arrival. Year after year, this simply does not change. The clams are in the same place I dug them last year and all the years before that. And where Native Americans had dug them centuries ago. I continued to dig steamers as I worked my way along the shore and then sat down to observe the geese....We eyed one another in a mirroring way; all of us knew why we were there. And all of us knew that the tide was dead low and that there was good reason for being where we were at precisely this hour of the day. I resumed my clamming and thought the geese had proceeded down the shoreline until I turned moments later and found them quite nearby, comfortably close to me upon the shore, using their bills to dig for clams. Nothing had changed for them either. The geese reminded me happily of why indeed I always feel somewhat philosophical when I go clamming. There is a satisfaction in knowing that some things in this fast-changing world are more or less constant.



A young crabber brings in the day's catch.

EVERGREEN PACIFIC SHELLFISH GUIDE

Evergreen Pacific Shellfish Guide

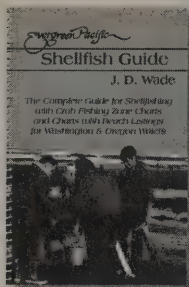
The Complete Guide for Shellfishing with Crab Fishing Zone Charts and Charts with Beach Listings for Washington and Oregon Waters

J.D. Wade

2000; 106 pp.

\$16.95

Evergreen Pacific Publishing, Ltd.
evergreenpacific.com



J.D. Wade is a Washington state commercial fisherman. He will teach you about the different types of clams, how to get oysters and crabs, and how to eat them. There are many photos and his voice is friendly and personal. A great guide on your shellfishing adventure.

“Mom’s Famous Clam Fritters

I first remember my mom telling the young people from the neighboring campsites at Westport, Washington, how to prepare razor clams they had just dug. She recommended a quick and easy recipe for clam patties known as “fritters.”

Ingredients:

- 1 cup pancake mix
- 1/4 tsp. salt
- 2 eggs (beaten)
- 3 tbsp. milk
- 1 “smidgen” (1tbsp.) butter
- 2 cups “minced” clam (we carried a small portable hand grinder for “mincing”; finely chopped will suffice)

Blend all ingredients and form into patties in a sauté skillet. Brown both sides and serve buttered. (I like to drip a little honey on them.)

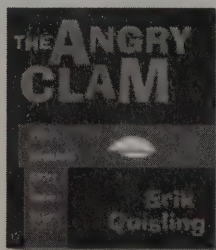
The Angry Clam

Erik Quisling

1998; 96 pp.

\$8.99

Warner Books



This is a humorous book about a clam’s life. Many colorful illustrations and clever text. It’s great because it can be interpreted into a human’s life.

FISHING CyberMall™



Fishing Cybermall

www.fishingmall.com

It sounds like an oxymoron, but this self-declared Internet’s “one-stop source for everything to do with fishing” does not lie. Links to books, videos, photos, conservation organizations, fishing consultants, catalogues, clothing, weather links, lakes and marinas, gov’t regulations. You name it, you can find it here. Not quite sure what you’re looking for? You can find that here too.

The Deadliest Job in the World

Original Productions

49-min. video

\$19.95 (\$24.90 postpaid)

Discovery Channel

PO Box 665

Florence, KY 41022

800/404-5969

A grueling forty-nine minute documentary about the lives of a crew of crab fisherman in Alaska’s Bering Strait. The big waves and drowning reenactment might be a little too much for the fainthearted, but for those interested in the culture of fishermen, this is a thrilling, provocative peek at an extremely dangerous job and the men who risk their lives doing it. Best line of the documentary: a crewman named Arthur points to his necklace on which three animal claws hang. “Bear claw,” he says as the camera pans to the first claw. “Lion claw,” he pauses. “My claw,” he laughs. Sure enough he is wearing his chopped-off finger around his neck.

Eastern Bay Manufacturing

136 West Pulaski Road

Huntington Station, NY 11746

631/423-4437

Only clammers really know of these shops that custom-make equipment. You can get all the tools at a local shellfisherman factory. I use Eastern Bay Manufacturing. You’ll need stainless steel rakes, aluminum poles, hose clamps, t-handles, and a rake clamp. You’ll

want a suitcase with a long back and a coppage and a merminator. There are also different types of teeth. You can get long (4” or short (2 to 2-1/2”). Shorter ones are for the summer, when the clams come up from the mud. There is also a mandatory cull rack. If the clams fall through you cannot take them. Then there are clam tongs. They are scissor-like things and can only get a couple clams at a time. Mainly south shore Long Islanders use them, but anyone who is in shallow waters would like them, because they aren’t that long. For oystering you can use dredges or rake them up with a clam rake. Sometimes we hit mussel patches. You get them the same way as a clam.

SEAFOOD CHOICES ALLIANCE

1731 Connecticut Avenue, NW

Suite 450

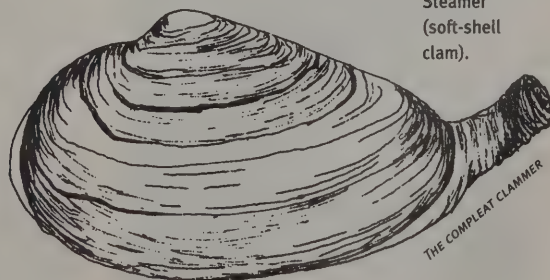
Washington, DC 20009

202/483-5365

www.seafoodchoices.com



The Seafood Choices Alliance connects professionals from the seafood industry with conservation groups to provide fishermen, chefs, and other purveyors with the information they need to make sustainable choices about seafood and offer the best options to their customers. Chefs, retailers, wholesalers, fishermen, and many others subscribe to the alliance. Working collaboratively with organizations, Seafood Choices promotes seafood options that protect fisheries, create a climate for positive policy change, and encourage conservation practices. —EP



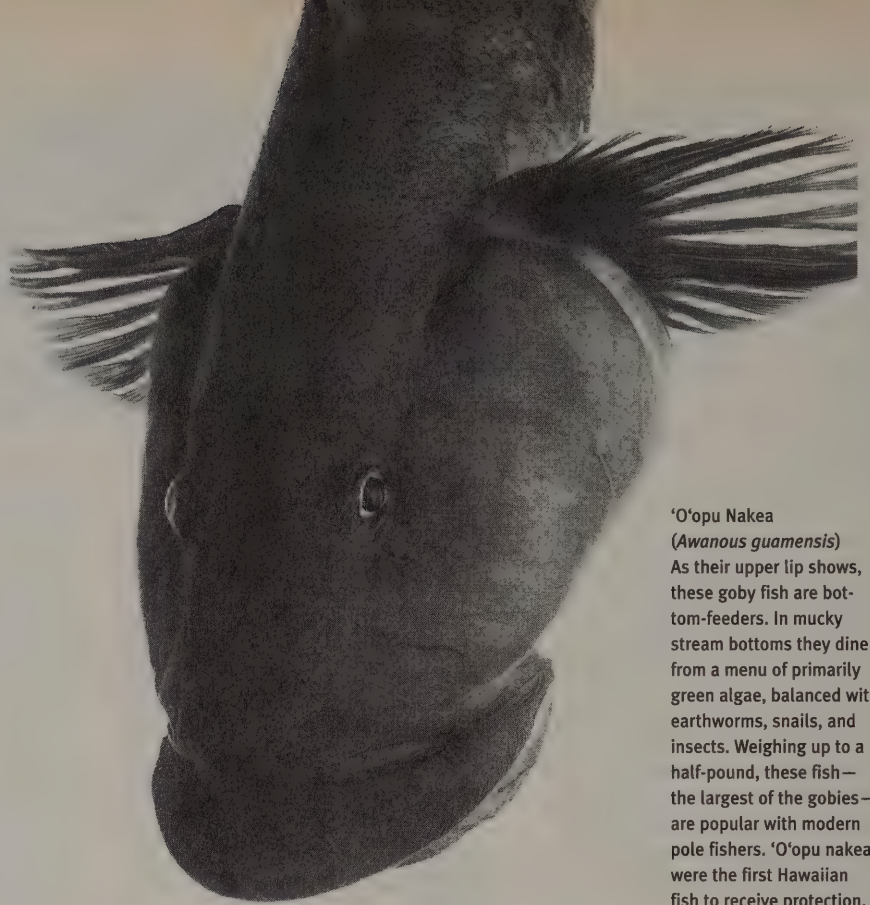
Steamer (soft-shell clam).

Remains of a Rainbow

Remains of a Rainbow takes nature portraiture to a new moment, where the eye must rest on a single creature, then wake up and slowly explore the body and texture of plant or animal. The photographs are exacting and soulful. The black-and-white images of the Hawai'i crow ooze with its intelligence. The happyface spiders make you giggle. The silversword requests a bow. These are not "wildlife photographs" taken in habitats that signal out-of-doors habitat and I-was-there, but closer to super-real paintings, each with a solid black or white backdrop and "brushwork" so fine that filaments of bird feathers or the expression of a bat's gaze grip the eye.

Both authors worked with Richard Avedon, and his elegance, simplicity, and insistence on seeing each living being completely and fully are everywhere evident. In fact, each photo is so engaging that I wished at times that the book form was replaced by a folio. It's hard to look at one striking color photo adjacent to another. You yearn for one photo framed by more space. The second or third time through, I actually covered the opposite pages with a blank piece of paper.

As good as this book is as photography, it is also the crucial tome for anyone in love with native Hawai'i. National Geographic has performed a gracious, educational, and caring act in publishing this book. Each portrait is of a rare or endangered plant or animal (many unknown to the world at large), accompanied by a tightly written species profile. You saw a few of these in Whole Earth (Fall 2000). —PW



'O'opu Nakea (*Awanous guamensis*)
As their upper lip shows, these goby fish are bottom-feeders. In mucky stream bottoms they dine from a menu of primarily green algae, balanced with earthworms, snails, and insects. Weighing up to a half-pound, these fish—the largest of the gobies—are popular with modern pole fishers. 'O'opu nakea were the first Hawaiian fish to receive protection.

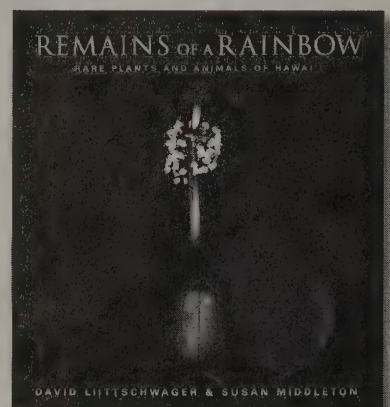
“ In the 1970s Keith Woolliams from the Waimea Arboretum on O'ahu took an interest in *Kokia cookei* and felt something needed to be done to bring it back from the edge. He went to Moloka'i and collected seeds from the tree in [George] Cooke's backyard. Just a few months later a brushfire swept through, killing Cooke's tree. Keith Woolliams got one seedling to grow at Waimea Arboretum and when it flowered he collected seed and tried to propagate it, only to discover that the plant wouldn't grow from the seed, which was not fertile. He tried cuttings and air layering, with no success, and finally tried grafting it onto a related species from the Big Island. He was able to get a few of the grafts to work before the mature tree that grew from seedling from Cooke's backyard died that same year. From those few grafts, other grafts were made from the top cuttings of the trees, but the seeds have never germinated.

Consequently, all of the *Kokia cookei* plants are clones with no genetic variability. Some of the grafted trees were planted back on Moloka'i

Tetraplasandra flynnii. Newly developing leaves resemble tiny hands reaching upward. *Tetraplasandra* are a Hawaiian endemic genus belonging to the same family as ginseng and English ivy. However, *Tetraplasandra* are majestic forest trees restricted to a small area on the steep, north-facing slopes of Kaua'i.

within fenced-off areas that protect them from grazing animals. Here they are maintained, watered, and monitored....Presently there are only fifteen individuals in the world—all grafts.

The tree we photographed in 1993 never flowered and eventually died. It wasn't until 1998, when we returned to Waimea Botanical Garden, that we were finally able to see and photograph the explosive red blossoms of *Kokia cookei*.



Remains of a Rainbow Rare Plants and Animals of Hawai'i

David Liittschwager and Susan Middleton
2001; 263 pp.
\$65
National Geographic Society

Environmentalism Unbound

Robert Gottlieb critiques environmentalism's "narrow conception of environment which has isolated it from vital issues of everyday life, such as workplace safety, healthy communities, and food security." His case studies include such seemingly pedestrian sectors as the dry cleaning industry's "chemical dependency" on toxics, the use of unsafe janitorial cleaning materials, and responses to hunger and malnutrition. Since these are arenas where the workers and families affected are predominantly poorer people of color, the issues are bound with questions of race and economic survival. Gottlieb is an academic and writes as one, but this is a valuable primer on the realpolitik of urban environmentalism. —Steve Heilig

Have you ever wondered why food stamp and school lunch programs are housed in the Department of Agriculture rather than Health and Human Services, or whether that might have anything to do with epidemic-level malnourishment and obesity among low-performing kids in urban schools? Gottlieb offers the best concise history I've seen of American food

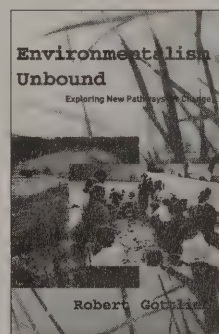
and food programs, while making the case for the priority of these issues in the environmentalist agenda. —MKS

"The Federal Surplus Relief Corporation became the Federal Surplus Commodities Corporation, and the primary thrust of surplus food programs was clearly established as grower support programs....[The] concept of expanding rather than displacing domestic demand for agricultural products cemented the evolution of food aid policy in the New Deal as a temporary adjunct to farm policy rather than as a form of social welfare or income policy.

...[By the 1990s] it had become increasingly clear that hunger intervention could not be successfully managed when solely defined as a moment of crisis for individuals requiring emergency relief. The problem of not enough to eat ultimately became part of a continuum of food insecurity problems at the community scale.

"The mainstream environmentalism that had emerged by the 1970s functioned on the basis of the division between work, product, and environment, whether in terms of policy or the advocacy

of consumer, occupational health, and environmental movements. This additional separation of the spheres of daily life paralleled the division of city and countryside (with the urban core identified as the anti-environment) and the erosion of the regional vision of balanced, ecological communities in the wake of the auto-induced fragmented metropolitan realities. By the end of the century, the environmental cause had become more cri-de-coeur than agenda for action.



Environmentalism Unbound Exploring New Pathways for Change

Robert Gottlieb
2001; 396 pp.
\$29.95
MIT Press



Parasite Rex

Tapeworms, liver flukes, and trypanosomes don't get a lot of respect. Biologists traditionally saw these organisms, simplified for life in other creatures' innards, as degenerate exceptions to the progressive trend of evolution. But as Carl Zimmer shows, parasites are among the planet's most successful life-forms. Their numbers and diversity are staggering: the majority of animal species are parasites, and many plants,

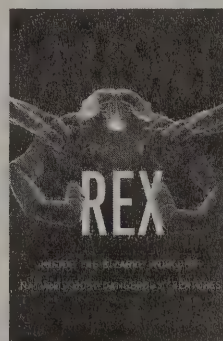
fungi, protozoa, and bacteria have followed this evolutionary path. They've colonized a multitude of microhabitats (a dozen different kinds may live in the guts of a duck, a hundred on the gills of a fish) and perfected ways of living off their hosts without killing them.

From the Costa Rican rainforest to a Southern California salt marsh to the cassava fields of Nigeria, Zimmer follows scientists as they inventory parasite species, work out their ecological relationships, and enlist their services in pest management. The picture that emerges is complex. Although parasites still exact an enormous toll on human health, they're also important indicators of the well-being of ecosystems; it's not the big predators who are really at the top of the food chain.

Parasite Rex is one of those books that change the way you see the world. On one scale, each of us is an ecosystem with an unsuspected complement of passengers. On another, if you view the Earth as an organism, there's a real sense in which we are its parasites—and we could learn a lot from the lowly tapeworm about sustainable exploitation. —Joe Eaton

"The inside of a body is a tough place to survive. With our air-breathing lungs, our ears finely tuned to the vibrations of the air, we are

adapted to life on land. A shark is made for the sea, ramming water through its gills and smelling for prey miles away. Parasites live in a different habitat altogether, one for which they are precisely adapted in ways that scientists can barely understand. Parasites can navigate through their murky labyrinth; they can glide through skin and gristle; they can pass unscathed through the cauldron of the stomach. They can turn just about every organ in the body—the eustachian tube, the gill, the brain, the bladder, the Achilles tendon—into their home. They can rebuild parts of the host's body to suit their own comfort. They can feed on almost anything: blood, gut lining, liver, snot. They can make their host's body bring them food.



Parasite Rex Inside the Bizarre World of Nature's Most Dangerous Creatures.

Carl Zimmer
2000; 298 pp.
\$14
Touchstone Books

Above: This crustacean invades a fish's mouth, devours its tongue, and takes the tongue's place. Then it acts like a tongue; the fish can use it to grip and swallow prey.

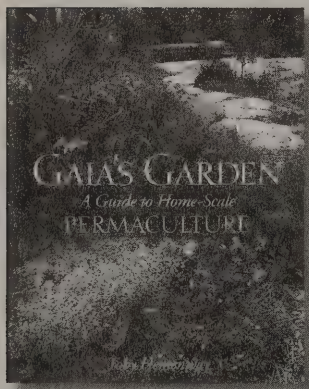
Permaculture: HYPE OR HOPE?

Two Exceptional Horticulturalists Duke It Out Over the Meaning and Practice of PERMACULTURE

Whole Earth has been printing articles and reviewing books on permaculture for more than twenty years. Permaculture seems to hold a special feel for those involved; for many of our friends and readers, it's almost a way of life. We recently sent Toby Hemenway's *Gaia's Garden* to Greg Williams, editor of *HortIdeas* (see access) for possible review. We normally don't print negative reviews, but we found Greg's comments on permaculture surprising and passionate, so we asked him to elaborate, and then asked Toby Hemenway to reply. —EP and PW

QUESTIONING PERMACULTURE

by Greg Williams



Gaia's Garden
A Guide to Home-Scale
Permaculture

Toby Hemenway
2001; 222 pp.
\$24.95
Chelsea Green

In the 1970s, while searching for environmentally responsible agricultural methods that I could apply to my small-farm "homestead" in Kentucky, I read *Tree Crops: A Permanent Agriculture*, by J. Russell Smith. Smith's vision of food and livestock feed-producing trees replacing tilled crops on erosion-prone hillsides seemed ideal for the rough topography throughout southern Appalachia and beyond. I established the Appalachian Regional Office of the International Tree Crops Institute U.S.A. [I.T.C.I.U.S.A.], began corresponding with tree crop enthusiasts around the country and overseas, started a fruit- and nut-tree nursery, undertook literature surveys and field research, and started publishing *Agroforestry Review*.

Soon I was hearing of novel "permaculture" ideas developed in Australia, adapting and extending Smith's idea of founding a "permanent agriculture" upon woody plants rather than annuals. Permaculture coinventor Bill Mollison's first trip to the US was

sponsored by I.T.C.I.U.S.A., and I recall my eager anticipation of his appearance at an intentional community near my farm. But my embarrassment knew no bounds when, not long into his first talk, Mollison pointed to a forested area and claimed that those woods were more highly productive than farmland. What I had learned about ecological succession (namely, that net productivity declines as ecosystems mature) belied that claim, and I was shocked into asking whether he was talking about productivity for deer rather than for humans. Things started to go downhill between us (and also between myself and several, others in the permaculture "movement"). My attempts—for example, when lecturing about tree crops at permaculture workshops—to point out the naive dogmatism contradicting ecological science that lay at the foundation of permaculture were generally ignored or dismissed as irrelevant to "real world" possibilities. But in the more than twenty years of the "movement," I have seen no scientifically respectable data (i.e., from experiments that include adequate control treatments) from permaculturists to refute my claim that their core ideas on the productivity of mature ecosystems are both unsubstantiated and contradict ecological theory.

In recent years, I have avoided arguing about first principles with permaculturists for several reasons. First, many of them showed no signs of listening. Second, the "movement" has remained small, almost entirely composed of individuals who do not require optimal solutions to pressing agricultural and ecological

problems. In truth, permaculture has had only a marginal impact on mainstream society and on the lives of many of its followers. Third, those at the forefront of the “movement” are

work). Therefore, protecting wildlands by making as productive use of backyards as possible would entail (1) maximum yields per unit area, (2) high yields per unit of resource inputs, and (3) high yields per unit of labor input. An additional stipulation can be added, although it is not implicit in the above argument: (4) local ecological conditions must not be degraded, and should be improved, by high-yielding backyard gardens.

There is a paucity of data from established North American “ecological gardens” (Hemenway’s term); quantitative data on yields are not given for

any of the example gardens in *Gaia’s Garden*, and input requirements are listed only very generally and incompletely. So, in the absence of “real-world” data, my critique will consider the implications of ecological theory for permacultural dogma.

A central claim in permaculture is that working with nature, rather than against it, requires using the mature forest (the last stage of ecological succession in much of North America) as a model for “ecological gardens.” Hemenway recommends using mainly early-succession tree species in

“ecological gardens,” but it is clear that his sentiments are mostly with mature as opposed to immature systems. Based on an (incomplete, in my view) chart,¹ he argues that mature ecosystems (in particular, mature forests) have several advantages over immature systems (such as meadows with pioneering invaders) and no disadvantages. In contrast, Eugene Odum, in his classic “The Strategy of Ecosystem Development,”² shows that mature ecosystems, in general, have a major disadvantage relative to immature systems in terms of net productivity. In other words, *if you are interested in maximum yields, look to immature ecosystems.* This principle has been put into practice since prehistoric times.

Hemenway correctly stresses that major resource inputs often provided to immature ecosystems—for instance, weed control and irrigation for conventional gardens and lawns—are required to prevent succession. Such inputs could be discontinued if succession were allowed to proceed—and then the gardens and lawns across much of North America would eventually become woody patches. The trouble is, Hemenway claims that such woody patches (or at least slightly modified versions of such patches, with greater densities of species that provide humanly desirable products) will (not *might*, or *sometimes could*, but *will*) have “abundant” yields, sufficient to help ameliorate the destruction of

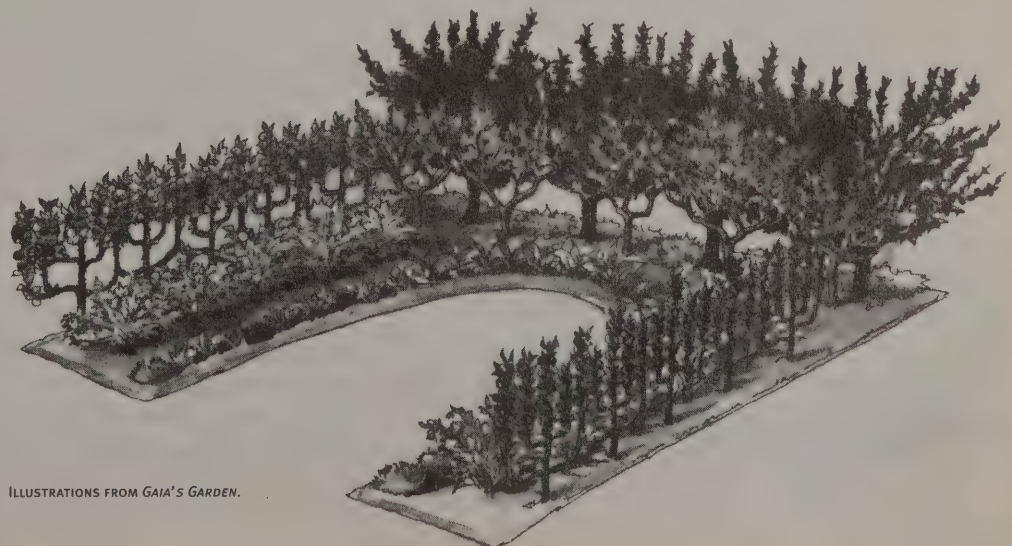
“... a forest garden has several layers, as does a natural forest. A simple forest garden contains a top layer of trees, a middle layer of shrubs, and a ground layer of herbs, vegetables, and flowers. Each plant is chosen for the role or roles that it will play, whether for food, wildlife habitat, herbal medicine, insect attraction, soil building.”
From *Gaia’s Garden*.



conducting interesting and potentially valuable (though unscientific) experiments in land use and social arrangements. At least some good is likely to come from these experiments. And fourth, I have remained on good terms with some (not especially dogmatic) permaculturists, whom I do not wish to alienate.

But, as the saying goes, ideas have consequences. And the fundamentally misguided ideas of some permaculturists—after a couple of decades of remaining almost completely internalized to the “movement”—show signs of polluting the larger culture, beginning with ecologically sensitive gardeners.

Toby Hemenway presents a compelling argument for maximizing the humanly useful production of backyard gardens. It must quickly be added that such maximizing should be constrained by the requirement that resource inputs be low and preferably sustainable. (And a highly practical caveat for gardens in developed countries is that labor requirements be fairly low—many gardeners, despite being well-intentioned, simply would refuse to do a lot of



ILLUSTRATIONS FROM *GAIA’S GARDEN*.

wildlands. Again, I have seen no empirical evidence that this is true, and ecological theory says that it is unlikely.

I am drawing on my experiences and reading far beyond *Gaia's Garden*. In the early 1980s, I extensively reviewed the agricultural and botanical literature, supported by a grant from the US Department of Energy, to determine potential yields of important nutrients (proteins, carbohydrates, and oils) from perennial (mainly woody) plants suited to temperate areas with moderate rainfall.³ I found data on around 800 species. Species in only fourteen genera were judged to have "high" potential. The situation is quite different in the tropics and subtropics, with many more species that have high potential for substantial yields of important nutrients. That is why temperate agroforestry has lagged behind agroforestry in warmer regions. Based on these experiences, I must characterize the following statement by Hemenway as extremely misleading:

"...for productivity you can't beat trees. An acre of wheat provides a mere 1 to 2 tons of grain, while an acre of apple trees yields 7 tons of fruit, and an acre of honey-locust explodes with 15 tons of protein-rich pods—without annual replanting."

How very sadly seductive! This should not be taken at face value!! Hemenway is not comparing dry-weight yields of specific nutrients; he is not considering the multiple problems of available yield data and their (lack of) generalizability; he is not taking into account "off" years with low

yields (especially probable when pruning and thinning are neglected); he is not mentioning maintenance, harvesting, and processing problems that have not been solved; and he fails to mention that neither apples nor honey-locusts are normally found in mature forests.

I am speaking out here because what Hemenway presents as fact—"The wealth of trees, shrubs, and other flora we have to choose from means that the forest garden can be as varied as a forest itself, and as individual as its owner. Some gardeners will want a veritable food forest, where the constant rain of ripe fruit and luscious berries almost warrants wearing a hard hat"—is likely to be accepted as at least a potential fact in their backyards by naive gardeners across North America. And then those gardeners will invest enormous time and money in designing and planting forest gardens from which they will expect both environmental amenities and "abundant" yields of useful products. When, after at least a few years, they discover that the yields are not so abundant, I suspect that they will blame themselves for poor designs. I want those potentially disappointed gardeners to understand, before investing their time and money, that ecological theory says forest garden yields are not likely to be impressive relative to more conventional garden yields.

Instead of trying to farm in the image of a forest, ecological theory says that, for high yields, they should be trying to farm in the image of a meadow. Countless organic gardeners have shown that meadow (immature ecosystem) gardening can be done successfully with quite low resource and labor inputs. Including my literature reviews of all facets of horticulture for my monthly gardening newsletter, *HortIdeas* (now in its eighteenth year), and my personal experiences with a wide variety of tree crops and organic vegetable gardening methods on my

own farm, I have yet to see any convincing evidence that temperate-zone forest gardens can do better than meadow gardens in providing useful products.

Permaculturists should start actually measuring and comparing the yields and other benefits of forest gardens to those of meadow gardens. I expect that, on average, the yields per unit area of the latter will dwarf those of the former, and that at least some examples of the latter will have yields per unit of resource and labor inputs comparable to the best examples of the former. It is even possible, though theoretically unlikely, that some examples of the latter will provide habitat comparable to that provided by some examples of the former. But I refuse to claim that I already know how the results will eventually turn out.

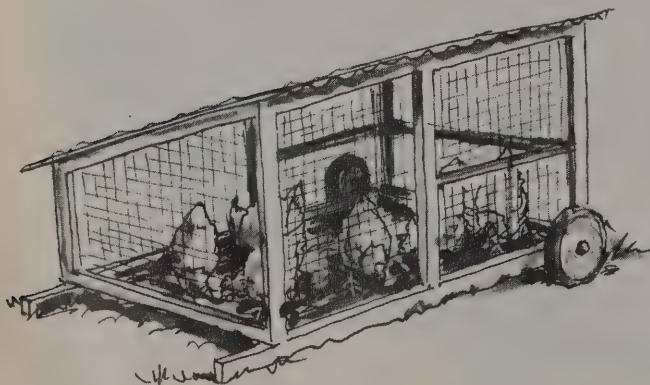
Permaculturists have neglected the scientific approach to determining the worth of their ideas via experimental tests that include controls, and instead have argued for and against particular gardening techniques on the basis of (at best) incomplete theoretical notions and (at worst) pure intuition. That is worse than glossing over the details; it is misconstruing the details, a practice which is arguably acceptable when their claims are made to a small group of willing participants who are not likely to suffer much from experiments that are based on unsubstantiated dogma, and who might come up with some useful non-mainstream ideas. But it is completely unacceptable when their claims are made to the general public, who stand to waste huge amounts of time and money on a (much) less-than-optimal approach to boosting garden output.

Greg Williams
Gravel Switch, KY

1. From W. H. Drury and I. C. T. Nisbet, "Succession." *Journal of the Arnold Arboretum*. 1973.

2. In *Science* 164. 1969.

3. See G. Williams and M. L. Merwin, "Energy- and Soil-Conserving Perennial Crops for Marginal Land in Temperate Climates." W. Lockeretz, ed., *Environmentally Sound Agriculture: Selected Papers from the Fourth International Conference of the International Federation of Organic Agriculture Movements, Cambridge Massachusetts, August 18 to 20, 1982*. Praeger Publishers, New York, 1983.



A TOOLBOX, NOT A TOOL

Toby Hemenway Replies

Greg Williams has written a passionate, articulate and—to the non-ecologist—persuasive critique of permaculture. So persuasive, in fact, that it sent me scampering to a basic ecology text to confirm that his central premise—that meadows and farms are more productive than forests—is completely wrong. His other claims—that my book is based on wishful thinking rather than research, and that there are no data to support permaculture—are equally incorrect.

Permaculture occasionally triggers a strong emotional response, which is the reason I suggested (unsuccessfully) to my publisher that my book's title not include the word, and why in the text I use the terms "ecological gardening" and "sustainable landscaping" almost interchangeably with permaculture.

The field has gained infrequent attention from both mainstream and alternative press. In part, this neglect is because permaculture's cofounder, Bill Mollison, is a brilliant but angry man who often deliberately alienates both critics and adherents (he attempted to suppress my book via threats of a copyright lawsuit; hardly the way to see one's ideas promoted). Indeed, Williams acknowledges he has been personally offended by Mollison.

But more importantly, permaculture suffers because it can't be defined in a sound bite—the kiss of death in a fast-food culture. Williams gives the impression that permaculture is essentially forest gardening. It's not. Permaculture is a broadscale design system that organizes concepts, principles, techniques, and strategies from many well-established fields into a pattern of mutually supportive relationships. If organic gardening, solar power, agroforestry, and other disciplines can be thought of as tools, then permaculture is a toolbox in which they can be organized for best use.



Permaculture is a meta-discipline, operating at a higher level than that of technique. It has been used to design successful landscapes, houses, villages, businesses, farms, and developments. Permaculture is founded on the belief that if we identify and use the appropriate principles from natural systems, we can finally begin to develop a coherent science of design, something strangely lacking in a species that supposedly designs its environment.

Because it is a broad design science, I've heard novice practitioners say "permaculture includes organic gardening (or straw-bale building, or consensus decision-making, or co-housing)," which can sound arrogant. This perceived omnivorousness aggravates specialists such as Williams who have painstakingly developed unique disciplines only to see them apparently subsumed under "permaculture." But permaculture is not a rival: it merely helps apply knowledge intelligently.

Permaculture's nature-derived design principles include suggestions such as "use elements with multiple functions" and "recycle materials on site." I searched in vain among my list of principles for what Williams says is at the foundation of permaculture, namely that mature ecosystems are more productive than immature ones. Since this supposed dogma forms the heart of Williams's critique, we should examine it.

When Bill Mollison said that a forest was more productive than farmland, Williams disagreed, not because he had any data—he couldn't have, since as we shall see, they support

Mollison—but because the statement contradicted his chain of reasoning about ecological succession. This misguided syllogism goes:

- (1) Mature ecosystems are less productive than young ones;
- (2) Forests are more mature than the meadows that farmland imitates;
- (3) Thus forests must be less productive than meadows and farms.

But Williams fails to note the difference between "mature" and "more mature." A meadow is an example of an extremely immature successional stage. A forest spans successional stages from early through middle to late or mature. Williams fastens upon this late, less-productive phase, ignoring the fact that a developing forest



(and by extension, a designed forest garden) may pass through eighty to 250 years or more of enormous productivity in early and middle stages before declining into senescent, late maturity, if it ever does reach late maturity (that elusive "climax" phase).

Williams offers no data to support his notion that forests aren't productive. He ignores all the research that shows forests are more productive than meadows and farms. The classic book, *Communities and Ecosystems*, by renowned ecologist Robert H. Whittaker, cites a benchmark study showing that in temperate deciduous forest, net primary productivity (NPP), the measure that Williams favors, is 1,200 grams of carbon per square meter per year, while

temperate grassland NPP is only 600 gm/m²/yr. Whittaker's data appear in dozens of introductory textbooks. In 1975, David Reichle (*Bioscience* 25:257) showed that forest NPP can be ten times that of a meadow. NPP of farmland, as several other studies show, is only 200–800 gm/m²/yr, and it achieves that only with vastly greater inputs than a natural ecosystem.

In addition, total biomass, diversity, nutrient and energy flows, sunlight captured, evapotranspiration, and many other variables are vastly greater in a developing forest than in a meadow (see the Odum paper that Williams cites, and work by Whittaker, Henry Horn, Reichle, and many others). Thus a garden designed in the image of a forest—a practice of many Europeans and other temperate and tropical inhabitants for millennia—may offer a century or more of immense productivity. This seems a reasonable time frame for the home landscapes I describe. Williams's statement that "ecological theory says forest garden yields are not likely to be impressive" is the opposite of the truth.

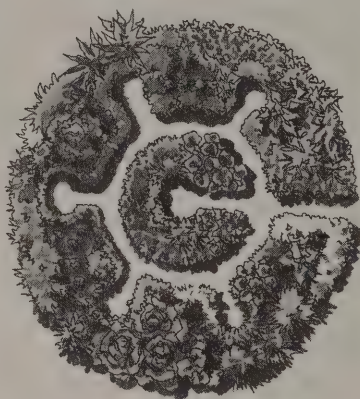
Permaculture and ecological principles suggest that agro-ecosystems that are successional more mature than lawns and annual-crop farmland can also be more productive. It is absurd to construe this as meaning that fully mature old-growth forests should replace row crops. Williams correctly notes that I recommend planting early (and middle) succession trees, yet refuses to acknowledge why.

Williams also suggests that there are no examples of permaculture design, when in fact there are more than 4,000 listed sites in over 120 countries. *Gaia's Garden* reports facts and observations from my experiences at over forty permaculture sites. But even a single "productive" garden based on ecological design is enough to demonstrate the validity of the concepts. I challenge anyone to visit a developed permaculture site and not be overwhelmed and inspired by its lushness and abundance. Williams's "garden in the image of a meadow" won't produce fruit, berries, nuts, firewood, bamboo poles, timber,

basketry and craft products, or varied wildlife habitat, it won't slow erosion or runoff, and it won't have the productivity of a forest. The sites I visited—from Cape Cod to Seattle to Tijuana—do all this.

Data from organic farming, appropriate technology, agroforestry, soil science, aquaculture, and a dozen other disciplines all support the techniques organized by permaculture.

Aid projects in Africa, Vietnam, Mexico, Brazil, Melanesia, and many other locations have employed perma-



culture and gain continued support from local people and aid agencies because of their success compared to other systems. Results from many of these projects have been published in agency reports, books, and permaculture journals.

Since I've written a gardening book and not a scientific monograph, it would have been inappropriate to load the text with more numbers than I give. But here are a few numbers from my own garden. Since I converted from "gardening in the image of a meadow" to applying permaculture principles, I use a quarter the irrigation water, half the fertilizer, and less than two hours per week of labor instead of six to eight, and have more food than I can eat twelve months of the year instead of four. My tally of beneficial bees and wasps has risen from eight species to over twenty.

Williams feels that my book wouldn't be so bad if I were suggesting ecological design only "to a small group of willing participants who are not likely to suffer much from experiments." This is

precisely the audience I target: not farmers or foresters, who must innovate cautiously or risk ruin, but adventurous homeowners who can easily afford to experiment with perennial vegetables, multi-layered gardens, water catchment, and well-tested design methods. I state repeatedly that ecological design is a young field and needs curious, inventive gardeners and others to continue the encouraging work done by its pioneers.

ACCESS

HORTIDEAS

Greg Williams, ed.
\$20/yr. (12 issues)
750 Black Lick Road,
Gravel Switch, KY 40328

We've been reading *Hortideas* for years for Greg and Pat Williams's reporting on the latest research and access for vegetable and fruit growers and gardeners, and more recently have regularly reprinted their reviews (with permission). Read *Hortideas* for details and discussions on every topic from mitorganite to xeriscaping. —PW

INTRODUCTION TO PERMACULTURE Concepts and Resources

www.attra.org/attra-pub/perma.html

Part of the Appropriate Technology Transfer for Rural Areas website, this is the best site for definition, history, and discussion of the principles of permaculture. For anybody with experience or beginners looking to learn more. Links to discussion groups, books, and a slew of resources. —EP

Speaking from Experience . . .

I've been practicing several permaculture techniques—such as soil rehabilitation and rebuilding diversity—since buying Sonoma County property four years ago. I found Gaia's Garden to contain valuable advice. It presents concrete techniques such as sheet mulching to build backyard biodiversity. It also introduces far-reaching concepts, like natural patterning and microclimates, in an easy-to-understand format, which could open the imaginations of gardening-oriented suburbanites. It doesn't offer the grand overview of Bill Mollison's classic Permaculture, but if enough suburban gardeners followed Hemmenway's tips and created their own islands of diversity, bees and birds could find welcome habitat in the vast asphalt-and-Kentucky-grass barrens of the US. And gardeners could find joy in the rich abundance of sustainable biodiversity. —Stefan Gutermuth

Breed Your Own Vegetable Varieties

Most professional vegetable breeders (in corporations or universities) have agribusiness values, resulting in new varieties designed for chemically supported, machine-harvested monoculture. Growers seeking vegetable varieties that reflect other values—that are tolerant of low fertilizer and water inputs, thrive in harsh climates, or have exceptionally good taste, for example—are going to have to do their own breeding. Carol Deppe, an experienced breeder of crops for sustainable agriculture, shows how to get started.

This revised and expanded version of the original 1993 edition is a painless way to digest ideas found only in the highly technical scientific literature, along with concrete examples that you can use as templates when planning your own breeding work.

Amateurs—who were expressing personal values far beyond the profit motive—bred all of our major food crops. Now these values of grower-breeders are urgently needed to counterbalance the values of agribusiness breeders. Dr. Deppe is eminently practical in providing the tools. —Greg Williams (editor, HortIdeas)

[Great access to seed-saving organizations and seed companies. —PW]

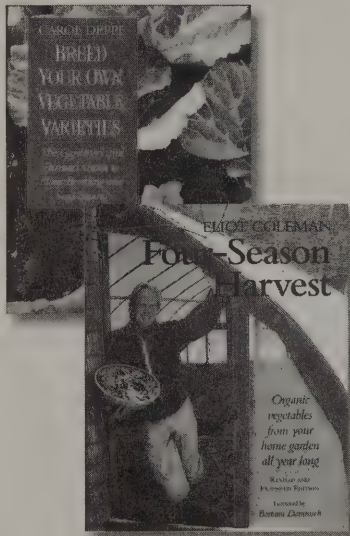
“Garden trials are scientific research. Good trials require good experimental design, execution, and analysis. But gardening trials are also just playing around, just trying things. Your trials are your curiosity incarnate. You conduct trials primarily because it’s fun.

“An additional aspect is the matter of the scope of the vision. All our food crops were originally created with standard plant breeding methods. All genetically engineered varieties represent relatively small changes in thoroughly established varieties, not whole new



Temporary A-frame greenhouse.

crops or whole new crop species. Genetic engineering could not create corn starting from wild teosinte today. Nor could it have created any of the other food crops we have today.... The universities and multinational seed companies have blindly jumped upon a single genetic engineering bandwagon. They’re all going in one direction. The main driving force behind the choice of research problems seems to be mostly a matter of whether the problem is one that can be approached by genetic engineering—not whether the goal is important or needed.



Breed Your Own Vegetable Varieties The Gardener's and Farmer's Guide to Plant Breeding and Seed Saving

Carol Deppe
2000; 367 pp.
\$27.95
Chelsea Green

Four-Season Harvest Organic Vegetables from Your Home Garden All Year Long

Eliot Coleman
1999 (revised ed.); 234 pp.
\$24.95
Chelsea Green

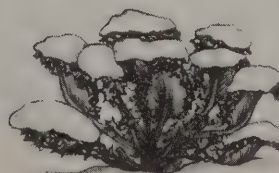
Four-Season Harvest

Since the first edition, Eliot Coleman has continued to develop and improve his twelve-month garden, adding new concepts and simplifying some techniques. He gained an additional dose of inspiration and knowledge during a visit to French winter gardens in January 1996 (described fully). There are also several great color photos that will inspire you to try harvesting nutritious and beautiful vegetables all year round.

If Eliot can harvest such wonderful vegetables in the winter in Maine, than just about any gardener in the United States should be able to garden twelve months annually, too! This book shows in detail how to do it, using simple backyard cold frames and unheated plastic-covered tunnel greenhouses. But the real key is Eliot's selection of winter-hardy vegetables—some familiar, some not so familiar—that will succeed with minimal protection. —HortIdeas

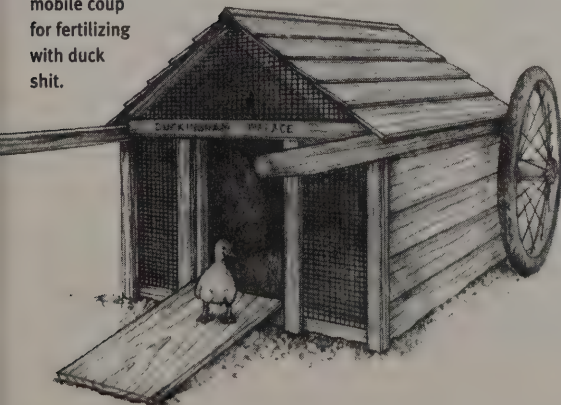
“My first experience with cold frames occurred when I was a child, long before I began growing plants. A gardening neighbor had a small cold frame in which she grew hardy flowers for early and late blooms. I can remember going over to her yard every so often to see the “magic box.” The drab tones of fall and winter prevailed in the outdoor world, but inside the frame, a riot of bright colors and green leaves existed. It was like looking into a warm friendly house on a cold, snowy night.... I experience that same fascination today when I look into the green and growing world of our vegetable cold frames. The magic is created with a single sheet of glass and the careful selection of hardy cultivars.

“Heavy snow accumulation on a tunnel greenhouse can do more than just block sunlight; it can collapse the structure. I don't mean normal snowfalls, unless the snow is very wet, but the heavy blizzards that come along occasionally. If a big storm is predicted, or if you plan to be away for awhile, you should take precautions. Place a 2x4 or similar structure upright under the center of every other hoop to provide extra support against heavy loads. Remove these supports when the danger has passed, as they make it awkward to move around in the greenhouse.



Kale covered with snow.

Duckingham Palace, a mobile coup for fertilizing with duck shit.



Online Health After the Dot-Com Meltdown What's Next?

Joe Flower interviews
Tom Ferguson and
Deryk Van Brunt

What if people could take charge of their own health, find out what they need to know, and help each other along the way? What if people could treat doctors as partners, collaborators, and expert consultants, rather than as the keepers of the keys? It's a powerful vision that has "Whole Earth" written all over it: Give people the tools, and they will do wonderful things. It animated many of us long before the perfect tool showed up: the Internet, with its amazing ability to distribute information and connect people.

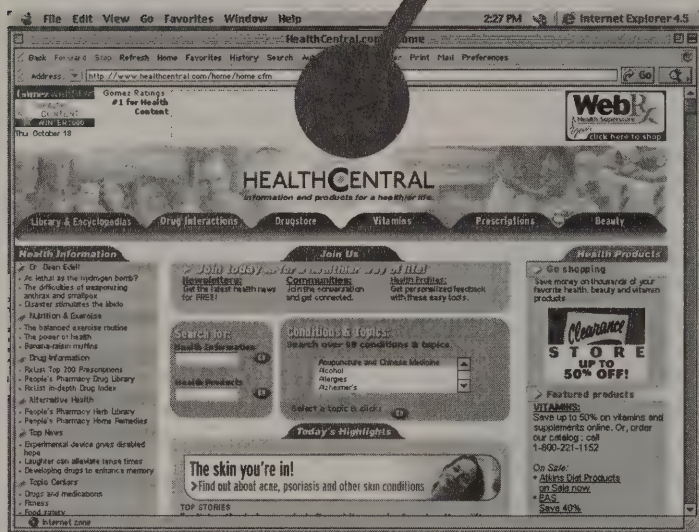
In the early 1990s the economy was popping with new media. Large media companies thought they knew what people wanted from these new media: movies, games, shopping, sports. When they conducted surveys and asked what people wanted, they literally did not believe the answer: health information.

The survey-takers were asking, "What's missing? What can't you get from the old media?" Even ten years ago, sports were all over the tube. You could pick up videos and music at the store, there were fifteen different ways to shop, a plethora of gaming platforms and venues. But health information—real, reliable, searchable, in words you can understand, customized for you or someone you love, from people you can question and trust—is scarce,

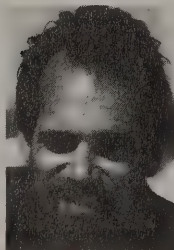
expensive, and sometimes just plain impossible to find. And when you need it, you really, really need it. It's not a luxury.

As the Internet boomed, Internet health information boomed with it, and in much the same shape: wild, chaotic, and bifurcated. On one side, people gathered in rapidly growing, voluntary peer-to-peer self-help communities. On the other side, commercial dot-coms popped up like fungi after a spring rain, and institutions from Harvard and the Mayo Clinic to Ma and Pa Beazel's Corner Hospital sprouted websites.

The popularity of health information has remained high, but times have turned hard. The dot-com flu hit health sites early and hard, and the few left standing are tottering, but the voluntary networks are still growing like weed gardens. Where are we headed? I talked recently to two of the bifurcators themselves: a dot-com executive vice president and an online self-help guru. One uses dot-com phrases like "burn rate" and "splash page," the other doesn't—yet both are idealists at heart. —JF



Health futurist Joe Flower is a longtime contributor to *Whole Earth*, as well as *Wired*, *New Scientist*, *Health Forum Journal*, and *Physician Executive*. He consults and speaks worldwide on the future of healthcare, and is a columnist and stockholder at HealthCentral.com.





Tom Ferguson: "The doctors are starting to catch up."

Yale M.D. Tom Ferguson (say "doctom@doctom .com" five times without slipping) is author of a dozen self-help books on health, founder of *Medical Self-Care* magazine, and once upon a time was the medical editor of *The Whole Earth Catalog*.

As the Internet has expanded, one number has held steady—about 70 percent of the people who use the Internet use it to find health information. Yet there has been an enormous gap between professionals and experienced lay people about the seriousness and value of online health resources. If you ask Internet users whether they could find what they needed online, and whether it was satisfactory, over 90 percent say yes. If you ask physicians whether patients can find good information online, most of them say no.

But the doctors are starting to catch up. As recently as two years ago I used to get a lot of calls from journalists saying, "Dr. Ferguson, can you find us one other doctor who agrees with you" about the power of using the Internet for health information and support groups, and of doctors using email. Now journalists ask, "Can you find us anyone who is against it?"

In 1993, when I first went to the annual meeting of the American Medical Informatics Association to

talk about patients having a role in online medical communications, I was literally told to sit down and shut up. They felt it was inappropriate even to discuss it. This year I've been asked to keynote the conference.

Three kinds of people use the Internet for health information. You could call them "the worried well," "the newly diagnosed," and "the chronic stables." The worried well use it occasionally and sporadically—they look up a symptom or a common garden-variety illness. They use it as an extended, searchable reference work, and they are looking mostly for traditional linear information written by doctors. About 60 percent of the people who use online health information are worried well, but they only account for 5 to 10 percent of the use.

The newly diagnosed are the heaviest users. They are only 3 to 5 percent of the users, but they account for 35 percent of the use. Chronic stables, people with some ongoing condition, account for the rest of the use. They regularly take part in discussions on mailing lists, or web-based online support groups.

Doctors tend to think that all patients use the Internet as a reference book, like the first group. But it's the second two groups who know the real depth and value of the Internet. They don't use the Internet just to look up linear information, but to communicate with physicians and with other people with the same condition, in patient-centered networks. They get a lot of support, and sometimes even care, through the network. These networks often allow people to be way ahead of their own doctors in the information they have about their particular condition.

Take the story of Karen Parles. In 1998 Karen, a 38-year-old librarian at a major New York art museum, learned that she had lung cancer. "My doctors told me it was incurable, that I had only a few months to live,"

she recalls. "I'm a lifelong nonsmoker, so the whole thing came as quite a shock. I was pretty overwhelmed at first. But as soon as I could, I went on to the Internet, looking for information. And I asked all my friends to help.

"I found a great support group for lung cancer, the Lung-Onc mailing list (listserv.acor.org/archives/lung-onc.html). The other patients on the list answered my questions, suggested useful sites, and gave me a lot of invaluable support. But even so, I had a hard time finding the information I needed. There was great stuff out there, but it was scattered across dozens of different sites. There was no comprehensive site that provided links to all the best online information for this disease."

Through a friend of a friend, Karen heard that a surgical team at Boston's Massachusetts General Hospital was developing a new treatment for her type of cancer. "I went to Boston to see them and I was pretty impressed," she says. "But having a lung removed by an unproven procedure still seemed pretty frightening, so I shared my fears with my Lung-Onc friends. I heard right back from eight or ten others who'd had a pneumonectomy. They assured me that I could do it and encouraged me to give it a shot. I was the twelfth patient to undergo the new treatment. That was nearly a year and a half ago, and so far, knock on wood, I'm doing fine."

Like many other patients who have used online support groups, Karen found the information there invaluable. "The group was a great source of advice for dealing with day-to-day problems during my recovery. Patients who've had chest surgery often have trouble sleeping because every position makes your ribs hurt. The folks on the list can tell you exactly what to do.

"After I recovered from the surgery, I got to thinking: I'm probably alive today because I'm wired and

well-connected. That didn't seem fair. So I started lungcanceronline.org, to share the resources I'd found with other lung cancer patients."

Karen's site offers access to in-depth information about lung cancer listings of physicians who specialize in the various types of lung cancer, medical centers and clinical trials, links to bibliographic databases, medical libraries, conference proceedings, journals, and other medical references. It also offers links for alterna-

tive medicine, online support groups, and survivors' stories. It offers access to Karen as well. "My Lung-Onc friends help keep me up to date on the latest research and all the new treatments," she says. "And if visitors to my site are having trouble finding what they need, I'll help them find it or I'll go find it for them. And whenever I learn something new, I put it up on the site."

AL-CASE, the Alliance for Lung Cancer Advocacy, Support, and

Education (the only national US support organization for lung cancer) now refers its members to Karen's site. Lungcanceronline.org is widely acknowledged as the definitive consumer site for lung cancer.

Why does Karen devote twenty or more unpaid hours a week to maintaining her site and helping other patients? "I suppose it's because it's so badly needed and no one else is doing it," she says. "But it's incredibly rewarding. I get these effusively grateful emails from people I've helped.

"This happens at the museum library too, of course. I'll find someone a fabulous seventeenth-century book on German woodcuts, and they'll be grateful. But when people say, 'If it wasn't for you, I'd be dead,' well, that's gratitude on a whole different level."

JF: What about commercial sites?

TF: As recently as two years ago, I was getting wild calls from dot-coms willing to throw money around. Now that commercial frenzy has all gone away, and we are seeing a shift toward online communities.

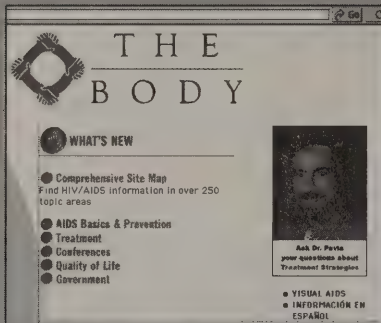
Even at their peak, though they were getting a lot of media, the dot-com side of this was very small. What people actually do online is search for their particular illness, and that side is almost all nonprofit. They want "my-disease.org." They want to talk to other patients, and they want annotated links from a lay-run hub site. Those professional interfaces are quite impenetrable to them. The information might be at the National Cancer Institute, but it's buried five layers deep. The annotated link will tell them just where to go.

A lot of people in these online self-help communities will have almost nothing to do with a commercial site.

JF: Is anything being done to guarantee the quality of online health information?

—TF, PW, and MKS

HEALTH ONLINE ACCESS



WWW.THEBODY.ORG

For AIDS.

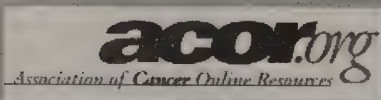


WWW.PSYCHCENTRAL.COM

A good general mental health guidance site with recommendations for specific sites on anxiety, depression, and many other conditions. They have ratings, and a place for you to add your rating.

WWW.LUNGCANCERONLINE.ORG

Karen Parles's site is highly accessible, and works closely with support groups. It is part of ACOR.org (see below).



WWW.ACOR.ORG

The Association of Cancer Online Resources, an umbrella group of over 100 cancer support groups, all volunteer-run.

WWW.DOCTOM.COM

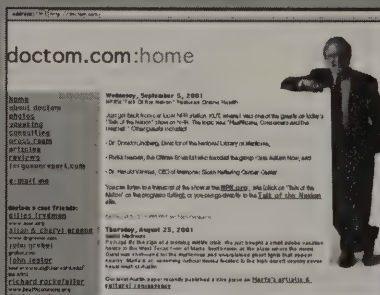
A new site from Tom Ferguson, "doctom's weblog," features links to interesting online health items, "doctom's cool friends," meeting announcements, and the editor's eclectic musings.

WWW.FERGUSONREPORT.COM

The Ferguson Report is "published at unpredictable intervals for the friends and associates of Tom Ferguson." Also available as a free email newsletter, it includes essays by Tom ("Ten Rules for Online Health Professionals"), listings of best sites, "DocTom's FAQ."

WWW.E-PCC.ORG

The Electronic Patient Centered Communication Resource Center, to which Tom Ferguson awarded his first "Sites 2B Seen Award." It offers tips for physicians and patients, and several sets of guidelines for developing clinic-based systems for doctor-patient email.



WWW.DRWEIL.COM

Dr. Andrew Weil, "America's Doctor" is a leader in the integration of Western and complementary medicine. He has written eight books; his site, "Ask Dr. Weil," receives over a million hits a day. He serves on *Whole Earth's* advisory board.

TF: The big players have established a “Good Housekeeping seal” group. The name is in transition, but everyone calls it “URAC,” after its original name. It costs \$5,000 just to apply to be a member, so it’s automatically only going to be for big players. In reality, most people judge the quality of information online the same way they do when buying a book. They use their common sense, they might have some sense of the author’s reputation or might ask other people interested in the subject. There is no single standard. The mother of an autistic child might not want to hear the opinions of a physician, for instance. She might want to hear the experiences of the mother of some other autistic kid.

JF: Is online health information changing the relationship of doctors and patients?

TF: These days the patients are teaching the doctors. As more and more of them show up in the office clearly knowing more up-to-date things than the doctors do about their condition, doctors are beginning to see that the rules of the game are changing.

People have two distinctly different types of relationships with physicians online. In Type 1, people find a doctor online, perhaps through a self-help site, or through the doctor’s own website. In this relationship you get the same kind of curbside consult you might get if you met a doctor at a cocktail party. It’s a lot like talking to an expert medical librarian or even an experienced self-helper. He or she won’t step into the take-charge authority role that you might be looking for, and certainly won’t diagnose or prescribe online.

In Type 2 your regular doctor says, “Let’s use email.” This conversation is almost completely identical with communications by telephone—“Do I need to come in, how do I prepare?” or after the visit, “What was it you said about this medicine, is this a

side effect?” and so on.

We are doing a series of promising quick and dirty studies for the Pew Charitable Trust, where I am a senior research fellow. We are interviewing a series of patients and their doctors to try to get at that gap in the way they see use of the Internet. We are also working at a major cancer center with a set of newly diagnosed people to see how we could remove some of the barriers and difficulties in using the Internet in those first three to six months, as they try to come to terms with their condition.

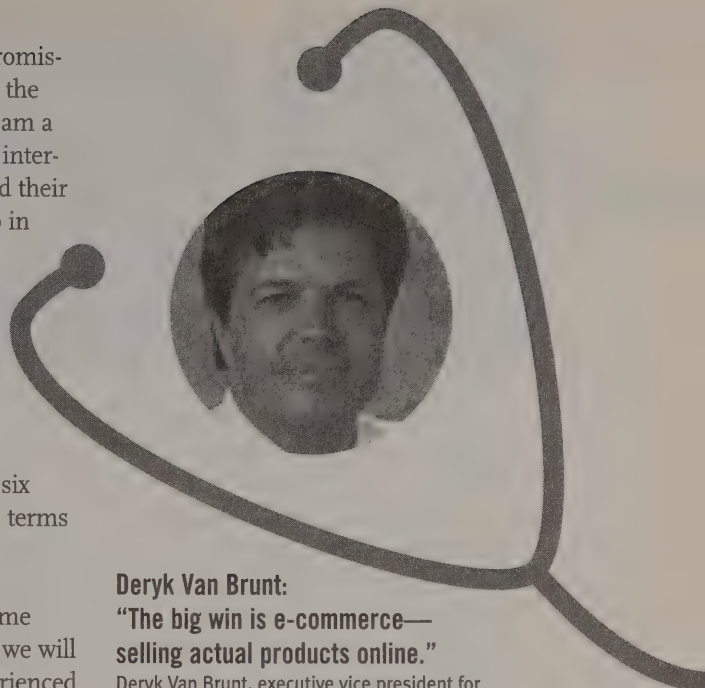
Some online communities operate at a very high level, some flail around. In another study, we will pick a flailer, then pay an experienced online self-helper to go in and facilitate that group, and see if it makes a difference. We keep exploring, asking what’s the leverage, asking where are the charismatic prototypes that can link that enormous lay volunteer community with the professional world.

JF: What do you recommend for someone starting out to use the Net for health information?

TF: Don’t search alone. Get the most net-savvy person you know to help you. I like the search engine Google, with its weighting system. Search for your topic, being as specific as you can. Then search for “your topic” + “support group” and “your topic” + “self help.” Finally, as you learn about the best resources, realize that you can be of help to others. Make some notes about what works, and look for opportunities to help others.

JF: What sites do you like?

TF: The idea that there is a single best site for a given condition is usually illusory. It’s more complex than that. But a few exemplary sites can give you a feeling for what is online [see access, page 98].



Deryk Van Brunt:
“The big win is e-commerce—selling actual products online.”

Deryk Van Brunt, executive vice president for business development and chief privacy officer of HealthCentral.com, holds a masters degree from the School of Public Health at UC Berkeley, and is a longtime stalwart of the “Healthy Cities” movement. The HealthCentral.com site includes health news, information on more than ninety conditions and topics, a health encyclopedia, links to more resources and self-diagnosis tools. About a third of the home page is links to products for sale.

HealthCentral.com started as a “content” site—free health information, supported by ads and sponsorships. But we got the joke early—whatever you are really here for, you’ve got to have a business model that works. So we began pushing the institutional side, building websites for institutions and licensing content to them. That’s a good business, but it’s small. It doesn’t scale.

About a year and a half ago, we understood that the big win is e-commerce—selling actual products online. So we bought DrugEmporium.com, Vitamins.com, and the assets of More.com (which sold large items like adjustable beds and wheelchairs), as well as a number of smaller operations.

We will bring in some \$50 million in revenue this year. Our WebRX.com is the second largest online pharmacy, and we have higher

gross margins than any of the leading online pharmacies. Though our sales are lower than the industry leader, Drugstore.com, our gross profits are the same or even higher.

We're still not profitable today, but we've gotten our burn rate below \$1 million per month, and it continues to drop. We have cut back from 350 employees to 150. We have cash in the bank. We currently forecast turning a profit by the end of this year.

Though 90 percent of our revenue comes from e-commerce, Gomez, when it rated healthcare sites, rated us as the Number 1 e-Health website. The content draws people in. Dean Edell, one of the founders of the company, talks to 20 million people a week over the radio, and he sends people to HealthCentral. When they get there, they find that e-commerce is a third of the splash page.

We believe this is exactly the right model at exactly the right time—assuming we can reach the inflection point of profitability.

JF: What was the result of the dot-com downturn?

DVB: A pure-play web health information business essentially doesn't exist. You have to have several businesses. Sites like OnHealth and DrKoop.com have gotten banged hard. There is still a ton of health traffic online; it's just not all going to one site.

JF: Besides making a profit, what are your goals?

DVB: The real goal of giving out health information is not just information, it's decision support: how do we help you make the best decisions? Neither we nor anyone else has accomplished that. But information, products, and services are all part of decision support. They are all of value to the consumer.

If you look at that literature about

behavioral change, you will see that people need several things to help them behave differently:

1) Information and awareness. Take weight loss: Is it important? Why? How does it affect health? Are there news articles about it?

2) A sense of susceptibility: Does this really matter to me? How severe is my risk?

3) A sense of communication: You might want to talk to other people in your situation.

Only after all that can a person move to making a decision to change their behavior. Our attempt is to keep it moving toward decision support.

JF: Can people trust information from a site whose business is selling health products?

DVB: The trust issue is very big. Our question, of course, had to be, Would people trust the same source for both content and commerce? In answer, we have built a Chinese wall between the two. We will speak frankly on the content side. Content creates the advertising space. We would never pollute it with merchandising. For instance, Dr. Edell slams some vitamins. But over on the other side, we're selling them by the crate. The commerce division says, "We have no opinion. We just want to know what you want, so that we can sell it to you."

We have no trickery, no sudden pop-ups. We don't track where you go on the content side and then send you email about products related to your condition. On the commerce side, on the other hand, we'll ask you whether we can send you email about special offers.

JF: Tom Ferguson says that lots of people who use self-help sites will have nothing to do with commercial sites.

DVB: There may be some truth

to that. Culturally, some of the people on those sites may see all commercial sites as part of "The Establishment." But I believe that other self-helpers see us as having lots of high-quality information, and see that we are working to gain the trust of users.

The self-help groups don't even go to the trouble that the large commercial groups do to attribute their content to the proper sources. We hold to a very stringent bar, and we are earning the trust of users.

JF: What about privacy?

DVB: The key to privacy is disclosure, letting people know what kind of information you capture, and with whom you share it, so that they can make informed choices. For instance, we don't share your information with anyone, unless it is necessary to do the fulfillment. But we have a contract with our suppliers that forbids them to share or make use of this information. They become part of our "chain of trust."

Over the next year privacy policies in the industry will be much more clearly written, and will have more teeth, because of HIPPA (the Health Industry Privacy and Portability Act), rulings by the FTC (Federal Trade Commission), and the new American Accreditation Health Care Commission (URAC).

The real privacy problem is not hackers stealing your information. The real problem is, what is your employer, your insurance company, or the government going to do with your health information? Do you end up fired, or denied coverage, because of the information you were looking for? Do you end up on endless mailing lists?

We feel that we are the trusted third party—a place where people can find out information and not feel that their search will get misused by someone. **we**

and then there was eve...

It's a little intimidating eating lunch with a woman who uses the word "vagina" in almost every sentence. But one does not turn down the opportunity to speak with Dame Vagina, otherwise known as Eve Ensler, the writer and star of the award-winning play *The Vagina Monologues*. Would she expect me to use the word vagina too? Would we use other words for it as well? Would people stop talking and stare? Would they choke on their food?

Almost everybody has heard of the monologues by now. Today, they are performed all over the world. A few years ago, Eve interviewed more than 200 women about their vaginas, a taboo subject almost everywhere. She traveled to the former rape camps in Bosnia, was almost flogged in Afghanistan, sat in the homeless shelters in New York City. Eve talked, laughed, and cried with women she met and then compiled the interviews into a series of monologues, with the hope that once women feel more comfortable talking about their bodies, they will be more empowered to stop the violence committed against them. She also created an international "V Day" (every Valentine's Day) to promote an end to violence against women and girls.

Her most recent play *Necessary Targets* was performed on Broadway to benefit Bosnian women refugees. Her next book, *The Good Body*, will be published by Random House in 2002.

Eve is New York chutzpah. Guts and glamor. Red lipstick and Louise Brooks bangs. A sharp wit, keen heart, and wicked sense of humor. Between performances, she found time to sit with me over pizza. "This is as radical as my life gets," she swore. Yeah right, Eve. —EP

Tell me about V Day.

It's a global movement to end violence against women. It's a catalyst, a spirit, an energy, a decision a day. It started in 1997 with a wonderful star-studded performance of *The Vagina Monologues* in New York, and that launched the movement. We raise thousands of dollars to stop rape, battery, incest, and genital mutilation. Since then we've done all-star performances in London with sixty-five colleges. This year it's close to 300 colleges, all performed and directed by students and some faculty and community people in fifty cities around the world. In Mexico City, where the show just opened and is a huge hit, they've hooked up with the women who are working to stop the violence in Juarez. In Manila, they've hooked up with the women who are stopping the sex trafficking of women. There was a tribunal in Tokyo with the comfort women who were raped during World War II. They did the Bosnia piece there at the tribunal, which was just incredible. We're also doing something called the International Stop Rape Contest where women from all over the world are submitting action plans, strategical and improvisational, to end rape. We've had two meetings so far. Most amazing women you'll ever meet.



One woman was a general in the Zimbabwe army, another woman began a movement to end honor killing in Jordan. The three winners of the contest will get grants to institute their ideas.

What changes have you seen since you started the monologues?

Everything goes inch by inch, but just the fact that you can say "vagina" now and you couldn't say it a few years ago. They just opened the first rape crisis center in the Balkans because of V Day in Croatia. So women can come in and talk about being raped. They opened it with V Day money. We bought a jeep for a Masai woman in Kenya so she could drive through the Rift Valley and educate people about female genital mutilation. [See page 103.]

What were the women like in the parts of Africa you visited?

I'll tell you something really interesting, because I asked women all over the world how they felt about their bodies, and the only women who really liked their bodies were African women. Some Africans have a ritual that is about cutting off their clitorises, but in a strange way they don't dislike their vaginas. It's just something they do. As a matter of fact, most African women I interviewed had no idea what I was talking about when I would say "Do you like your body?" They'd be like, "Of course I like my body. What are you talking about? It's my body." It's like I was a Martian. One woman said to me, "Do you like a tree? I mean do you go, I like that tree more than that one? We're all different trees." It was really beautiful.

Do you ever get sick of talking about vaginas?

Never. No. It's just fascinating. I love women. I just can't believe how interesting they are. And I've always loved people. Sometimes I'm tired, when I've done two shows and a talk-back, and I go out and a woman says, "I *have* to talk to you," and I'm like, "uhh, maybe not this minute." But not because I'm not interested, just because I'm tired.

You are famous for your sense of humor...

That or die [laughs]. If you don't have a sense of humor, you can't deal with the stuff we're talking about. It's too awful. Look, the world is so awful and if you don't have a sense of humor first of all you can't really look at what's going on because it will really crush you. But also everything's really funny. It's insane. This morning I was on a radio station and a woman called up and said she had to sing me a song. She had changed 'My Funny Valentine' into 'My Funny Vagina,' and then she sang it over the radio and I was like, 'Okay, this is funny. It's like nine in the morning and she's singing 'My Funny Vagina.'"

Last night a man was just standing on the street screaming the name "BUSH" over and over. We thought he was saying "CUNT" and we were like, "Wow, he was really taken by the show." And then we were like, "No, that's Bush he's saying." Stuff like this happens all the time.

How do your audiences affect your shows?

Sometimes you just don't get the laughs and you're just like, "Ahh, forget it. We're not going to go there" [laughs]. Other audiences, you go out and people are so ready to party and you think "OKAY!" And some places you go out and they're...[makes a scowl]. I just did this performance in New York, and I had to perform for all these big high-profile people who had donated to V Day. I went out and I swear to you for forty minutes the only person laughing was my partner, and I could hear him going, "Huh...Huh..." It was a total nightmare. I was about to stop and go, "Listen, it's not working. Go home. Sorry." And then at the end they all stood up and I was like, "Why?" And then they all came up to me and said, "Oh my god, my life has changed!" And I was thinking, "Jesus, what kind of life do you have?"

What next?

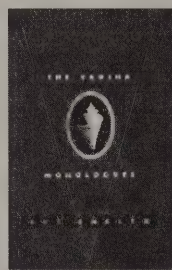
I need to go in and write again. I've been out for a long time. I just have to create a way to do that and that's getting harder and harder. I don't feel as grounded when I'm not writing.

What sustains you?

I work out. I train everyday. That's the best thing. Because what I've discovered while I'm on the road doing eight shows a week is that if I don't train at least four or five days a week my body gets really tired. But if you train, then your body stays up with you. You know, it's respecting it. It's nurturing it. It's like everything. I've learned so much about the

body since I started doing *The Vagina Monologues*. If I'm disconnected from my body, I'm disconnected from everything around me. And if I'm inside my body I feel the weather, I feel the trees, I feel the sky. It's all the same.

When women are raped and violated they are forced to disconnect from their bodies. It's kind of like separating rain from thunder. When you are being raped and beaten, you can't stay in your body. It's too awful. You can't sustain the pain so you dissociate and you fragment. I would venture to say that many many women on this planet have been forced to disconnect from some trauma to their bodies.



The Vagina Monologues

Eve Ensler

1998; 118 pp.

\$12.95

Villar

www.vaginamonologues.com, www.vday.org

I saw the show with my two female roommates. One minute we were laughing. The next we were crying. But the whole time we were feeling grateful that

Eve had done this for us. The monologues run the gamut of emotions and women's experiences. But they are not special because of their revealing insights. Just the opposite. They are profoundly moving because they remind us of what we already know; an affirmation of who we are and from where we come. Here, old women speak, Bosnian rape victims, sex workers, lesbians... Vagina facts too. A portion of the proceeds go to the V Day Fund. If you can't make the show, the book is the next best thing. —EP

"I'm worried about vaginas, what we call them and don't call them. In Great Neck, they call it a pussycat. A woman there told me that her mother used to tell her, "Don't wear your panties underneath your pajamas, dear; you need to air out your pussycat." In Westchester they call it a pooki, in New Jersey a twat. There's "powderbox," "derriere," a "poochi," a "poopi," a "peepe," a "poopelu," a "poonani," a "pal" and a "piche," "toadie," "dee dee," "nishi," "dignity," "monkey box," "coochi snorcher," "cooter," "labbe," "Gladys Siegelman," "VA," "wee wee," "horseshot," "nappy dugout," "mongo," a "pajama," "fannyboo," "mushmellow," a "goulie," "possible," "tamale," "tottie," "Connie," a "Mimi" in Miami, "split knish" in Philadelphia, and "schmende" in the Bronx. I am worried about vaginas.

"I Was There in the Room

... I was there when the doctor reached in with Alice in Wonderland spoons and there as her vagina became a wide operatic mouth
singing with all its strength;
first the little head, then the gray flopping arm,
then the fast
swimming body, swimming quickly into our
weeping arms...

I stood, and as I stared, her vagina suddenly became a wide red pulsing heart.

Possessing the Secret of Joy

As a feminist, I have made it my business to hear the facts about Female Genital Mutilation. In my privileged, college-educated, white girl position, I hear about it all the time. So why read more about it? What else is out there that I haven't heard and cried about yet? As an African American author, Alice Walker has made it her business to keep people like me listening, to give voice to the ones who have lived and died from this emotionally and physically crippling tradition. We hear the personal voices of everyone involved, both the African woman Tashi, who chooses in her adulthood to return to her country and have the surgery done, as well as Tashi's American lover Adam and her non-Olinkan friend, Olivia. Tashi's need to connect with the community that she left

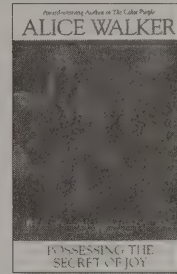
when she moved to America ultimately forces her to return to her roots and physically reconnect herself with her people. Is a culture's strength dependent upon the acts it carries out? Must people continue to mutilate small girls to feel a sense of community?
—Devon King

“There are those who believe Black people possess the secret of joy and that it is this that will sustain them through any spiritual or moral or physical devastation.

“Who are you and your people never to accept us as we are? Never to imitate any of our ways? It is always we who have to change.

You want to change us, I said, so that we are like you. And who are you like? Do you even know?

You are black, but you are not like us. We look at you and your people with pity, I said. You barely have your own black skin, and it is fading.



Possessing the Secret of Joy

Alice Walker
1992; 288pp.
\$14
Washington Square Press

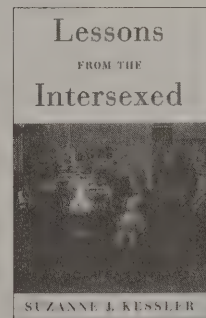
Lessons from the Intersexed

Lessons from the Intersexed is an incisive look at the fifty-year-old Western medical practice of surgically reconstructing the bodies of infants born with genitals that do not look wholly female or male. One of every 1,000 live births contains some form of intersexuality. The majority of these infants, formerly labeled hermaphroditic, are forced to undergo procedures that adhere to strict measurements of phallus length and width. Kessler's academic publication is the first to expose the medically acceptable ranges for the genitals of a newborn (0.2 cm to 0.85 cm for an infant's 'clitoris,' 2.5 cm to 4.5 cm for an infant's 'penis'). We see that, in fact, it is the decision of the attending surgeon that determines whether or not a parent goes home with a little girl or a little boy.

The tension felt by those present at a birth is universal. There is concern for the health of both the infant and the mother. Most people, though, are not consciously aware of how the anatomy of the arriving infant can quickly push concern for the infant's health and well-being by the wayside. —Kristi Bruce

“Accepting genital ambiguity as a natural option would require that physicians also acknowledge that genital ambiguity is ‘corrected’ not because it is threatening to the infant's life but because it is threatening to the infant's culture.

“Indeed, if culture demands gender, physicians will produce it, and of course, when physicians produce it, the fact that gender is “demanded” will be hidden from everyone.... Institutionalized mutilations occur because the genitals are taken too seriously.



Lessons from the Intersexed

Suzanne Kessler
1998; 193 pp.
\$18
Rutgers University Press

ACCESS TO LOCAL AND GLOBAL INTERSEX AND FEMALE GENITAL MUTILATION INFORMATION

INTERSEX SOCIETY OF NORTH AMERICA

www.isna.org
Every day five children are subjected to unconsensual genital mutilation in America. Learn more facts like these at the site devoted to ending shame, secrecy and unwanted genital surgeries for people born with anomaly of the reproductive system.

PARENTS CELEBRATING OUR INTERSEX CHILDREN

www.intersexsupport.org
Support and information for parents of intersex children. Giving them more choices besides resorting to surgery.

FEMALE GENITAL MUTILATION EDUCATION AND NETWORKING PROJECT

www.fgmnetwork.org
Facts about what actually happens during mutilation, where it takes place, who is involved, ways to contact other people involved, legislation facts.

GLOBAL WOMEN INTACT

www.celebrateclitoris.com
Sia Amma's organization works to build alternatives to the mutilation ceremony. Work is done in America to help young girls strengthen their views of their body, through improvisational workshops. In Africa, they help mothers find other ways to continue the cul-

ture that does not endanger their health and take away their sexual agency.

WWW.FEMINIST.ORG /NEWS/NEWSBYTE /FGM.HTML

Index of articles since 1996 on female genital mutilation.

The Place of Music

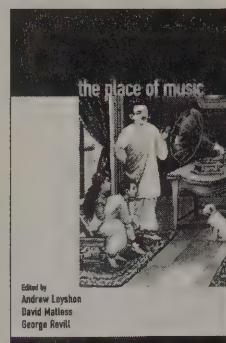
This effort by British geographers to enlist cross-disciplinary dialogue on the place of music yields a dozen essays, among them "The Early Days of the Gramophone Industry in India," "...The Cultural Politics of Sound and Light in Los Angeles, 1965–1975," and "...Bilingual Terrain in Scottish Song." Why not? Scholars will find familiar theoretical ground a

bit labored in places, but the book will be interesting and entertaining to the general reader who wants popular music writing other than TV chintz, the sociology of youth deviance, and how to rip off the dark others' exotic riffs. Timely, varied, smartly done. Worth considering as an intro to music scholarship with a cultural studies spin. —Steve Taylor

" [Woody] Guthrie's personal views and political attitudes, however, remained inherently complex. In the case of "This Land Is Your Land," for example, the original manuscript shows it to have been a six-verse song with a compassionate, strongly socialist message. Yet despite its composer's continuing reputation as a figure on the American left, he developed a four-verse rendition (verses 1–3 and 5) that stripped the song of an important part of its message. The so-called radical verses (4 and 6), with their references to the inequity of personal property and unemployment lines, were deliberately omitted. The popularity of the song in the postwar, and especially the post-McCarthy, period was thereby assured at the expense of some of its meaning. —JOHN R. GOLD, "FROM 'DUST STORM DISASTER' TO 'PASTURES OF PLENTY'"



Sarasvati, the Hindu goddess of arts and learning.



The Place of Music

Andrew Leyshon,
David Matless,
and George Revell,
eds.
1998; 326 pp.
\$24.95
Guilford Press
www.guilford.com

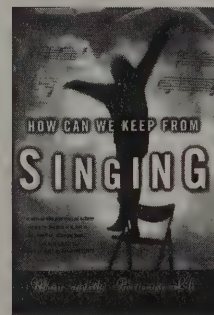
How Can We Keep from Singing

For me, a lifelong choir addict, singing has always been a golden thread leading through—though not out of—the labyrinth of experience. Joan Goldsmith agrees. Her autobiographical meditation upon choral music as amateur career, therapy, and metaphor for life may move you to try it, or try it again, or try whatever other activity your own "invisible instrument" (not necessarily your voice) may suggest. For Ms. Goldsmith singing is a great joy, but no panacea. Life still hurts plenty; sometimes (but not every time) shared passionate musical expression makes the pain seem bearable, even meaningful. The writing is sharp, the many wise generalizations balanced by unflinching honesty in the face of data conflicting with hope for lasting peace and personal fulfillment. —Patricia Perry

" Always, always they will ask you to give more—more concentration, more purity of sound, better line, finer adagio...and you will ask yourself what you are doing here after a hard day's work, when you don't feel that good anyway and your spouse is mad at you and your kids say you never get anything right and there isn't enough money to pay all the bills. Then suddenly it flows—a bar, a phrase, perhaps even a whole movement—and you are the physical instrument of something higher.

Then you know creation's assignment: to learn the notes, to find your music. The invisible instrument is the one instrument we must all learn to play.

" I am awed by the rich contributions of the not famous—the fifteenth violinist, the accompanist, the singers in the chorus....We're everywhere—the passionate, committed, talented, frequently unpaid or underpaid workers who make possible the great things of life. We're the utility infielder, the middle manager, the small-enterprise entrepreneur.



How Can We Keep from Singing Music and the Passionate Life

Joan Oliver
Goldsmith
2001; 223 pp.
\$22.95
W.W. Norton

Wildlife Works

Money and soul under African skies. Wildlife Works owns an 80,000 acre "corridor" between Tsavo East and Tsavo West National Parks in Kenya. It was a disaster area of poaching, squatters, and deforestation. Now, elephants and lions have no fences and fear. The squatters have been moved by the local community to 5,000 acres set aside for them. It was done with no violence and much cooperation. Wildlife Works has designed perhaps the first for-profit company to help the rural poor stay put, have work, and maintain the great Pleistocene fauna of Africa. First they built a 20,000-acre rammed earth eco-factory location that became the first rural export processing zone in Kenya and has begun assembling t-shirts and other garments. Then they hired various locals as anti-poachers and found grant money from the European Economic Commission for a school program that Wildlife Works administers. Now they are finding their market niche with tres kool t-shirts, safari jackets, and other fine rags made of organic fabrics. Right now most of their production remains in the Bay Area; as sales increase, they will switch more and more to Kenya.

Wildlife Works is important for several reasons. Short-term loans and grants in Africa cause a "development" blip that disappears with the grant, but a heartfelt, committed business has a long-term investment in a community's success and transfers skills and management knowledge. (That's why the schools are crucial.) Many national parks have isolated and disenfranchised neighboring locals, turning them against the parks. An economic weave like Wildlife Works creates a mutual commons to protect wildlife and provide hope.

Wildlife Works is at the stage of finding social venture capital. If you're interested, call them. (The minimum investment is \$50,000.) Its founder and manager, Mike Korchinsky,

Wildlife Works's 20-acre eco-factory on the edge of Tsavo National Park became the first rural export processing zone site in Kenya. The eco-factory provides jobs for people in the community.

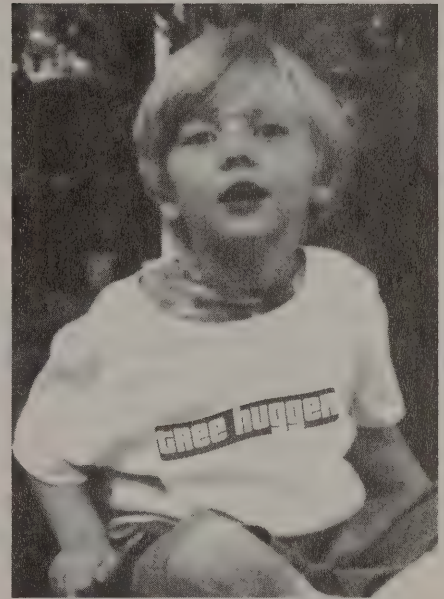


Left: David, Peter, Mike, Emily, Devon, and Deborah model Wildlife Works clothing. Wild deer and ferocious bucks roam the nearby Marin savannah. Below: Zevi Tamar-Mattis, five years old, has been hugging trees since birth.

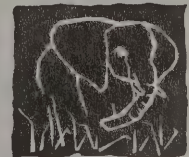


presided over one of the fastest-growing US management consulting firms (according to Inc. magazine) before he gave up the fast lane for the hard, dust-filled, and bumpy road of sustainable business creation. He is the money/soul glue (or should I say acacia gum) of Wildlife Works.

For fun and support, small purchases off the website or by phone of silky raglan sleeve tops and, my new favorite gift, baby tees or the super-fancy safari jacket. Logos range from the imaginative (mine says "Rhinos XXXL") to the bumper sticker-like "Extinction Sucks." —PW



EXTINCTION SUCKS



Wildlife Works

Wildlife Works

475 Gate Five Road, Suite 120
Sausalito, CA 94965.
888/934-WILD, 415/563-4900,
www.wildlifeworks.com

Welcome to David Bolling, our new publisher (see page 110).

Bird news: For reasons known only to a small family of acorn woodpeckers, this year seems to be a good one to store acorns in outer walls of the Falkirk Center, our residence. They've neatly tapped holes under the eaves (they first spot an acorn, judge its size, then hew the hole to fit the acorn, then stuff it in for winter larder). The Falkirk staff installed a repetitious long-toned screech. A hurt rabbit? A great horned owl in heat? A badly designed emergency vehicle siren? The peckers couldn't care less. Then staffers hung banging aluminum pie pans from the roof, all in time for their conversion of the building to a haunted house for Halloween. Now we listen to clanging, screeching, and woodpeckers.

Forgive us for this late-arriving issue. As David makes clear, we still hurt for income. Some readers assume we'll always get through somehow (since it's happened before), but we really do need the help. So we need to say: we depend on you for us to keep on truckin'. We also decided to modify our solstice/equinox schedule in order to get the Winter issue into stores during the holiday shopping season. You did not lose the Fall issue. We've extended subscriptions by one issue.

The *Whole Earth Board* has hardly been slacking. Sunita, Danica, Diana and Ron pulled off a funders' dinner at



JouJou, headliners at the *Whole Earth* funders' dinner. The women's a cappella group sings Balkan, Appalachian, Italian, and Greek song, and "goofy international folk jazz." www.joujousings.com.

San Rafael's Chinook Restaurant, where Sunita is owner and head chef. JouJou (see picture) sang. Old-timers like Jerry Mander met new-timers in the ever-expanding *WE* net. Nancy Ramsey read from her *The Futures of Women*. Her c.v. has always left me in awe (Committee for National Security; legislative director of Women's International League for Peace and Freedom, Club of Rome, coauthor of *Nuclear Weapons Decision Making*).

Stephanie Geyer-Stevens arrived at *Whole Earth* via Hawai'i and a farm in Sonoma County with a greeting, "Ty [see page 57] sent me." She's helping with fund-raising and great proofreading (fresh eyes are a blessing, after we've been reading the same texts for weeks).

Bioneers: sellout, great fun. We pulled in about \$2,500 in subs and back issue sales, with great PR from Kenny Ausubel and Nina Simons (Bioneer founders and MCs) on how *Whole Earth* has been a major vehicle for the long-term paradigm shifts. Dropping by our booth: a 25-year career army officer said he used to white-out *Whole Earth* at the bottom of the page and send select articles around as intelligence reports; Mary Appelhof thanked us profusely for promoting *Worms Eat Our Garbage*, which has now sold 145,000 copies (See Flower Press, Kalamazoo, Michigan, for all the great teaching about worm books); Eric Rasmussen, surgeon for the Third Fleet, told me more about a robot, the size of a cocker spaniel, that entered the World Trade Center ruins with infrared detectors to search out survivors. It brought along a plastic tube

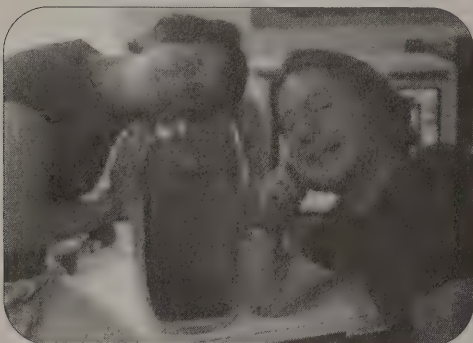
into which water and nutrients could be fed until the rescue team arrived. Editorial board member Andy Weil, Paul Stamets of neural fungal net fame, and Lynn Margulis (we first published the Gaia Hypothesis in the US) gave auditorium-stuffed speeches.

Whole Earth ranks: Given no outreach budget, and a distributor that hasn't worked very hard on our behalf, it was amazing to find that *Whole Earth* ranks as the twelfth most frequently encountered of the "specialty mags" on college newsstands. We sprang ahead of *Biblical Archaeology Review*, *Foreign Policy*, and *Girlfriends*. *Whole Earth* tied with *Audubon*, *Civilization*, *Foreign Affairs*, *Joey*, *America's Civil War*, *Civil War*, and the *Kaplan Career Guide*. Amazing, the number of Civil War mags in the top twelve.

Not surprising, the top specialty mag was *High Times*. The widest selling "non-specialty" mags—*Cosmopolitan* and *Glamour*—are, to me, exquisitely specialized. To get a feel for this college survey, remember last year's neck-in-neck was *Cigar Aficianado*, tied with *Smithsonian* for third. Conclusion: to gain newsstand presence, *Whole Earth* covers should sport a dope-smoking Confederate.

High times whole earth news: Viagra has done more to save rhinos than the World Wildlife Fund. Since Viagra gets it up more reliably than powdered horn, Asia has made a quick switch, and poachers have lost market share. Now we need a product substitute for Yemeni knife handles, the major cause for African rhino deaths.

The sun shines longer after December 21. Peace and happy trails.
—PW



We want to thank Jonathan Frieman. Stefan and Deborah hug a great new Mac G4 design computer donated by Jonathan. A much happier design team is playing *Ma Ya* by Habib Koité while pushing pixels and never crashing!

LETTERS

Whole Earth is a conversation. Compliments, cavils, and corrections are welcome. Letters and email may be (reluctantly) edited for space or clarity.

Long-term Affection

Dear *Whole Earth*,

A couple of years ago I subscribed, after reading sporadically for years. I had some "intermittence" with my subscription, and some problems with a back order. I didn't follow up on this until this past spring, about two years after these minor troubles.

Whole Earth responded, generously, by sending me a package of all the issues I'd missed, as well as the back order I'd not received, and an issue or two extra.

Not only was this package wonderful in itself, but it's reminded me—as I pore over issues from 1999 and 2000—that what *Whole Earth* does is important to me. Thank you so much for keeping at it, for your generosity, for your largeness of vision and spirit. There is something profound I feel about *Whole Earth* that I have trouble articulating. I guess I just want you folks to keep doing it!

Thanks again!

Hans

By email

Dear *Whole Earth*,

I have been a *Whole Earth* reader

since 1970. Your articles and news have inspired and informed me, as well as my cohorts, on everything from the "art of massage" to "passive solar housing." Thank you for still being around.

Your friend,

Dana Dodd

By email

Mr. Warshall,

I hope this letter finds you exceptionally fine. I am presently serving a twenty-five-year sentence for bank robbery, which is my first incarceration. I have learned to live in the land of ZO by being extremely flexible, but just to survive is not good enough. I received a copy of *Whole Earth*, Fall 2000 from a pen pal at the Human Kindness Foundation, with the beautiful truth which Lanakila Brandt so grandly expressed [*Whole Earth*, Fall 2000].

How easy it is to become so engrossed in our spiritual evolvment that we lose sight of the very force that gives any of it meaning—the simple act of loving. Without it, it's all dry and empty. This love transcends ourselves. Yet try to grab hold and call it "mine" and it loses its magic. Love does what it will, and lets it go at that.

Peter, I am requesting a one-year complimentary subscription. This is a 24-7 lock-down max facility. No work...I am indigent....

Keep the faith,
Nemo Valentine #143638

Oaks Max Facility

PO Box 38

East Lake, MI 49626-0038

[We were able to give Nemo a sub, thanks to a donation from a *Whole Earth* friend. We welcome donations earmarked for schools, jails, and persons and groups with minuscule funds. —Ed.]

Persuasive Book Review

Wow! Julia Butterfly Hill (*Whole Earth*, Spring 2001) is truly an inspirational heroine! I now will purchase *The Legacy of Luna*. I want to read this woman's derring-do and bravery as she sat on a platform that was attached to Luna for two long years. It is so important to make an issue that our redwoods need to be saved and I believe Julia's message was loud and clear. Plus, she did this in a peaceful way! Hurray for Julia and Luna!

Sincerely yours,

Paul Dale Roberts

Office Manager, Political Reform

Secretary of State

Elk Grove, CA

Viridian's Bitch Goddess v. the Computer Geeks

Dear *WE*,

When I come up against the evils of

THANKS

Many, many thanks to all who generously donated to *Whole Earth* between March and October (donors since October will be thanked in the next issue):

The Center for Ecoliteracy, David Berman, Peter Blasko, Mark & Amanda Brady, Linden & Truman Chiles, Linda Connor, Gretchen Flowers, Jonathan Frieman, Katharine Kunst & Katherine Fulton, Douglas Gook, Diana Hadley, Kenneth Hamik, Peggy Hitchcock, Michael Hutton, Ph.D., David Johnson, Stephanie Johnston, Alex Gault, Stefan Jones, Keith Jordan, John Larson, Peter Leyden, Jerry Mander, Jeff Mendelsohn, Anthony Mize, Robert Monroe, Michael Phillips, Carolyn Raffensperger, Linda Remy, Alex Saunders,

Leland Shupp, Donna Sofaer, Helen Stanley, Sandra Wallenstein, Margaret Wells, Jolie Wiggins, Sallyanne Wilson, Karla & David Wilson.

More Thanks for

DEVELOPMENT

Peter B. Collins (KSFO-AM)
Keith Jordan
JouJou (www.joujousings.com)

EDITORIAL

Reuben Margolin (see page 48) says thanks to Lee Swenson and our editorial board member Vijaya Nagarajan for partially funding the table car and introducing many excellent friends for dinner.

ENERGY SECTION

Chris Clarke (*Home Energy*)
John Clarke (RMI)
Jason Denner (RMI)
Paul Ehrlich (Stanford)
Thammy Evans (RMI)
Tom Fieler (RMI)
Andrew Kadak (MIT)
Amory Lovins (RMI)
David Payne (RMI)

OTHER EDITORIAL

Peter Coyote
Kevin Kelly
Lynda Winslow

my computer, a goddess—bitch or otherwise—is not what presents itself (see “Technology: The Bitch Goddess” in *Whole Earth*, Summer 2001). When my Mac crashes mysteriously again and again (and again), when I try to make sense of the ridiculous bells and whistles of Microsoft 2001, when Netscape 6 garbles a carefully designed website that looks fine on older browsers, it is not a dark feminine force that rears its ugly head. No. What I curse is the digital masturbation of a bunch of male computer geeks who don’t know their ascii from a hole in the ground. It’s not about a dance with the goddess, it’s about competition, greed, tight-release deadlines, and inattention to true human needs. Don’t foist the goofy and maddening VCR problem on a feminine archetype. It’s the women (like Deborah Tibbetts) with their “keen and kind eye” who might just bring some sanity to this runaway devil called technology. Furthermore, I could care less about the size of Joel Garreau’s Rolodex.

Yours in wholeness,
Bonno Bernard (maniacal subscriber)
Higher Glyphics
Santa Cruz, CA
P.S. Loved the issue. Neal Stephenson cracked me up.
Austin rules.

Holistic Cows and Cowboys

Dear Mr. Warshall,
I very much enjoyed reading the article by Dan Dagget (“Ranching Back to Nature: A Photo Essay on Creative Cows”) in your Spring 2001 issue. The article presented two of many examples of using grazing and animal impact as restoration tools. What Dan failed to mention is that the people mentioned in the article, the Tiptons and the Wheelers, are Holistic Management practitioners. This would have been important to mention, since Holistic Management has been used so successfully in so many management situations.

The Holistic Management decision-making framework offers a way to

identify what you are managing toward in terms of land, finances, and people. I would like to see an article featuring some of these Holistic Management practitioners. For more information please visit our website and feel free to contact the Savory Center.

Sincerely,
Tina Pilione
Savory Center for Holistic
Management Affiliate
Eunice, LA
www.holisticmanagement.org

Can't We Be Glamorous?

Dear brothers and sisters,
I am all for guest editors, but guest graphic designers? Summer 2001 is painfully ugly. I can’t believe this helps to sell your wonderful publication.

Jack Burnett-Stuart
By email

Why the cigarette in the girl’s mouth on the cover? (*Whole Earth*, Summer 2001.) What’s the deal here? What’s the point? As if it had not already been done a million times. Howard David Johnson did the cover art. I’m sorry, but if you want people to pick up a magazine you need to do better than that. You need to study what magazines that sell do to lure readers. The name of the game is “celebrity,” that’s how the media works today! I don’t know who the girl is on the cover. I’ve never seen her before. Should I know her? What does she do? What’s her message? At the very least, give her a cigar and goof on something real.

There is a desperate need in America, in the world for that matter, for a green magazine that will grab people by the gonads and hit a bull’s eye in consensus reality. It’s not as if the environment isn’t the biggest socio-political hot potato around. So what is keeping publishers like Hachette, Conde Nast or Hearst from zeroing in on the target and making a killing?

Whole Earth is a bible to me. As director of the Environmental Library Fund, I have ALL the back issues, at least I think I do. If I’m missing a few, I’ll have to track them down when the collection finally gets a proper home



Who are you?

Will the model who posed for the cover of the Summer 2001 issue of *Whole Earth* please come forward and identify yourself?

outside of the storage boxes stockpiled in my house!!! There is no doubt that the writers, researchers, thinkers, and dreamers in the environmental community need a much more “visual” and trendy outlet for their vision if that vision is to ever reach into the hearts and minds of the silent majority.... Not until visually minded creatives and intellectually minded creatives get together to collaborate on a green magazine will a green magazine strike pay dirt at the newsstand and give *Newsweek* or *ELLE* a run for their money.

But how do we get the two together? That’s the problem. There have been timid attempts in the past like the EcoTech conferences, or to a certain extent the Bioneers. But bottom line is you never see Madison Avenue or 7th Avenue types there “ever”! Why? Ask Anita Roddick, perhaps her new book will attempt to answer that question. Then you have the Hollywood green-celebrity think tanks like Earth Communications Office or Environmental Media Associates. But unless you are part of the entertainment industry, it’s a closed-door policy, just like the velvet rope at a trendy night club. So real activists and environmentalists rarely if ever get a

chance to share their ideas with the Hollywood set, even though organizations like ECO or EMA claim it was their original intent.

There are a few who manage to cross the bridge and straddle the fence like Woody Harrelson or Ted Danson, who are equally respected both in their acting profession and in the environmental community.

I had high hopes for the Viridian special *WE* issue. But it's not going to stand out on the newsstand. It's not going to break sales records. It's going to make *WE* readers and subscribers happy, but it's not going to generate a groundswell of new interest. If greens and environmentalists are seriously interested in creating deep-penetration publications as vehicles for solutions, then they need to hunt down folks like the designers of what once was called *Sin*, then *Hypno* in San Diego. They need to beg, barter, and steal Juxtapoz for creative talent. They need to swoop in on top fashion photographers and twist their arm to produce amazing green shoots!!! They need to convince top-ranked modeling agencies to release their girls for special green assignments. We need to give the people what the people want!

That's why *Lü* [a magazine Remy hopes to launch —*Ed.*] will keep ringing doorbells and wringing necks when necessary. Look at the time and resources we are wasting on a multitude of little green zines while the winning newsstand formula for effective large-circulation green magazines is dying to erupt on the scene! How much longer are we going to have to wait for people to consolidate punch power and pin down an Oprah or a Martha Stewart to do the right thing, and let a crack team of magazine designers finally unleash a supersonic green magazine on the world?

Get with it. Stop rehashing old ideas and concepts. PVs sold door to door might save the world one suburban roof at a time! Hemp might save the world if American farmers can grow it again! New energy science will save the world if environmentalists get their heads out of their asses and start

listening to the researchers. But first a visionary publisher needs to see the potential and instigate the mix. I can't be that publisher, because I'm dirt poor! Necessity is the mother of invention. But I can be that editor. Hello out there? Ready for a ground breaking green fashion magazine named *Lü*?

Remy Chevalier
remyc@prodigy.net

Whole Earth Page Design

A while back, I was so taken by the issue with photos from Antarctica that I looked up the staff in the credits and found a name I recognized—Stefan Gutermuth—a friend who went to school here in the '70s. A few issues later, I wasn't so impressed, but the reader mail you published was all full of appreciation and delight. My seeming minority view prompts me to write.

Am I the only one who wondered what happened to something fresh and wonderful in the *Whole Earth* design? Hey, I've enjoyed Kevin Kelly's stuff, but the [Winter 2000] issue seemed to be thrown together to prove it could be done, which I can appreciate, but cannot agree that it is a great leap forward from Gutermuth's work. It seemed ironic too that something so willy-nilly in design was a thin veil on what was essentially a shopping catalog for nerds who fly around a lot and have a lot of disposable income to toss the way of status and toys. (Don't get me wrong, I read about those expensive hunting knives.)

Anyway, I've been reading *Whole Earth* since it was *CoEvolution Quarterly* (It was Stefan who first showed it to me, come to think of it.) I'm a grass-roots organizer turned designer/editor so I might spread a few sound bites and bright campaigns from the left to a larger audience than the folks in my township that fought against longwall mining. Being self-taught, I started out copying (or tried to copy) the stuff I liked. *CQ* was on top of the list for innovation with a tight budget and ecological intelligence setting the design constraints. I don't think the Kevin Kelly issue was done with that vision.

Get Gutermuth or someone with

his skill back on board.

Michelle Ajamian
Rural Action Communications
Athens, OH
www.ruralaction.org

Born Again Truck Store

Know what's funny? The *Whole Earth Catalog's* website merely pushes *Whole Earth's* paper publication.

What could the *WEC* become? What should *WEC* be?

It should be links—to websites where you can buy the books and tools.

It should be a catalog—with all the little samples and illustrations that makes the *WEC* paper book so endearing, but with the extended usefulness provided by leveraging of the power of the Web.

It should be a store—with most everything you list available, by arrangement or partnership with Amazon.

Would I pay \$10 a year for access to this online service anytime I want? Yes. But you should be able to make enough on the store to cover all the expenses of doing this.

What do I find now? A store that wants to sell me a book. Unbelievable! Every new medium relates to itself in terms of a previous, obsolete medium. We knew this in the 1960s.

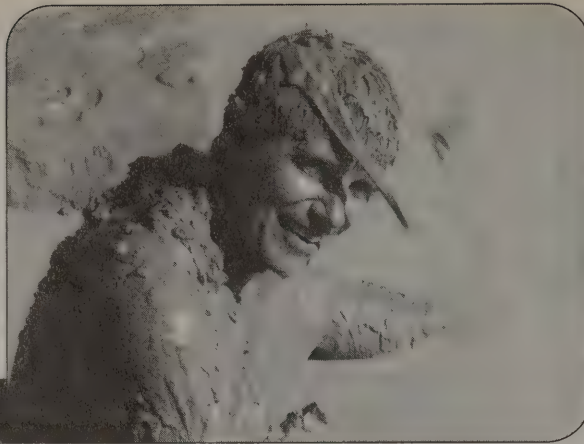
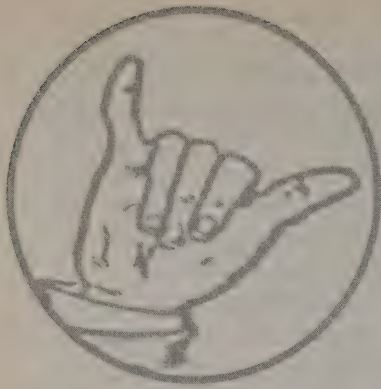
Good luck!
Regards,
Philip M. Armstrong
Gladstone, MI

[We're working on everything you mention. Agree with you too! Any development capital to spare? —Ed.]

Plutarch's Error Is Ours

Very interesting summary of the ancients' knowledge of burning mirrors. (*Whole Earth*, Winter 1999.) But Plutarch was in error. The Romans never used burning mirrors in that way, and Plutarch actually described a periscope. See Chris Rorres's site <www.mcs.drexel.edu/~corres/Archimedes/contents.html>, and pull down references to burning mirrors.

D. L. Simms
By email



Publisher's Message

Whole Earth lucks out once again. This time it's our new publisher David Bolling. He owned and edited the *Santa Rosa News Herald* and the *Sonoma Business* magazine and directed *Home Energy* magazine. He was executive director of Friends of the River and founding president of Friends of the Russian River (Sonoma, County CA). Excellent local credentials and financial savvy, we all thought in the interview. On top, he loves water (page 38) and outdoor adventure (page 66), and worked handsomely hosting, writing, and reporting for Outdoor Life Network TV. Water, outdoors—I was sold in the first five minutes. He co-authored *How to Save A River* (Island, 1993) and recently married. David knows the publishing biz. The only uphill hike he faces is our future. We're happy to trudge behind. —PW

Above:
David in the
Colorado
River mud.
(He looks
much cleaner
in person.)

Whole Earth has persisted for thirty-three years because there is a need for information and ideas that empower people to take control of their lives and to use the resources of this planet in an intelligent and sustainable way.

We know the need is there because—when we have occasionally faltered under the pressure of publishing a nonprofit, money-losing magazine—you have said, in so many words, don't go away, we need you. When we ran out of money and closed this thing down in 1996 you wouldn't let us; you sent us so much money and encouragement that we had no choice but to continue.

For three decades we've been sharing access to tools, practices, and ideas that will help make your lives more interesting, understandable, fun, cost-effective, energy-efficient, healthy, sane, organic, sexually satisfying, spiritually rich, technically attuned, and intellectually alive.

I recently assumed the role of publisher to help lead *Whole Earth* into its own sustainable future. The path that led me here covered a lot of different terrain and in some respects

Whole Earth has been the culmination of a lifelong identity crisis.

When I got here I felt right at home, not just because Peter and Mike and Emily and Devon were kindred spirits, but because the values embedded here for three decades still resonate and may be more relevant now than ever. The range of information we've published defies classification. We've described how to hand-spin poodle hair (1970), build super-insulated houses (1980), and inventory all the Earth's species before they're gone (2000). We've also reviewed products as diverse as the one-man Alaskan sawmill (1968) and the robot "walking machine with flamethrower" controlled by a guinea pig named Stu (1988).

Of vastly greater importance, we've introduced two generations of readers to a wildly eclectic menu of ideas and information that, in Stewart Brand's words, nurture "the power of individuals to conduct their own education, find their own inspirations, shape their own environments, and share the adventure with whoever is interested."

If the true face of the new millen-

nium is at least partially revealed in the events of September 11, then the contents of this magazine are not only relevant, they're urgent. Sustainability is not just about wise use of resources; it is about the cultural, political, and spiritual footprint we leave on the planet. And if energy futures, the particular focus of this issue, is one part of the process to achieve freedom from terror, we won't get there unless a lot more people conduct their own education.

Creating a sustainable culture is part of our mission—and you play an important role just by reading what's here. But **we need a lot more of you. We want to triple the number of subscribers, because the resulting revenue can make us self-sufficient. So if each of you gave two *Whole Earth* subscriptions to friends this holiday season we'd more than double our total circulation and you'd have bought two meaningful and inexpensive gifts. There's a coupon inside to make it easy.**

Meanwhile, our annual, year-end appeal is nearing the launch pad. We're asking you once again to help us make up the difference between what it costs to publish this 70-percent self-supporting magazine and what the magazine earns. We need about \$160,000 in grants and gifts annually. Our loyal supporters literally keep us afloat. The water trading will continue until our subscription income reaches critical mass, and that's one of my primary goals. **So give what you can, buy subscriptions, and if you have an extra Apple G4, a CD burner or slide-tray scanner lying around, we could use that too.**

Finally, I want to thank you. Our readers have been loyal beyond comprehension, and we are only here because of you.

David Bolling

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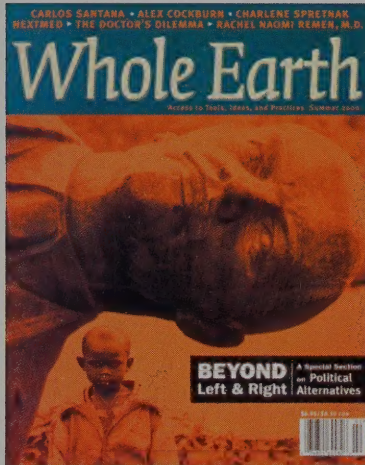
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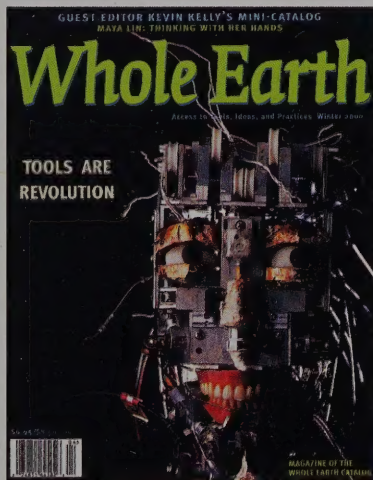
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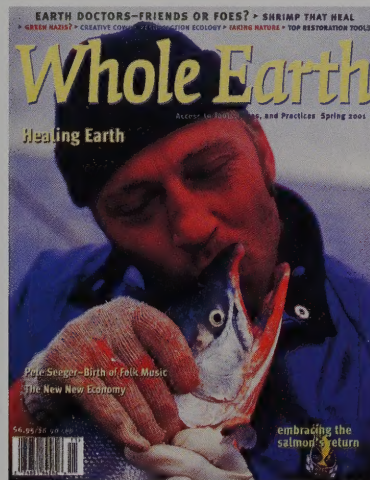
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